

August 1, 1966



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(NOTES 8/1/66)  
GEORGE C. MARSHALL SPACE FLIGHT CENTER  
HUNTSVILLE, ALABAMA

## Memorandum

TO Dr. Wernher von Braun, DIR

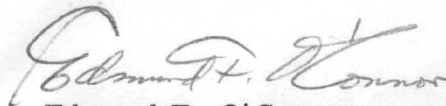
FROM Director, Industrial Operations, I-DIR

DATE SEP 9 1966

SUBJECT Geissler Notes of 8/1/66 on AS-203 Performance Incentive

The situation described in Dr. Geissler's notes whereby the Chrysler Corporation Space Division may not be awarded maximum fee for performance for the flight of S-IB-3 has not yet been finally resolved. Prior to the flight, a three-sigma end condition of flight box was developed and mutually agreed to by both the Government and Chrysler. The end conditions of flight were developed on preliminary data even though Chrysler had had in their possession documents which defined final performance data since May. Possibly they considered that the cost which would be incurred to more accurately define the end conditions of flight using the new data would outweigh the possible loss of bonus fee. However, the incentive structure of the Chrysler contract is such that they will receive at least target fee for this flight. They will not be penalized below target even though the cutoff of the S-IB stage was outside the box agreed to prior to the flight.

Investigation of this situation reveals two areas in which improvement is required. One is on the part of the contractor to assure that he uses the best available data in making predictions. The second area is in the procedure for transferring data from Rocketdyne to Chrysler. This situation has been discussed with Chrysler management and they have been requested to submit their data requirements through the contracting officer. When these requirements are received, a formal channel will be established through which Chrysler shall obtain the required data. The problem in this case is not really incentive contracts, but is the general lack of discipline which we have allowed in the exchange of data among our contractors.

  
Edmund F. O'Connor



NOTES 8/1/66 GEISSLER

Bill Davis  
cy sent 8-15-66  
B 8/7

Ed O'Connor  
and  
Ollie Hirsch

Your  
comments  
and  
suggestions  
are  
invited

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1. AS-203 Performance Incentive: Final analysis of the post-flight trajectory for AS-203 shows that the S-IB stage altitude was an insignificant amount of 70 m outside the allowable End Conditions of Flight (ECF) envelope at separation. As a consequence, CCSD can lose their incentive fee of \$79,406 on the first vehicle incentivized even though we had an extremely successful mission. The deviation was due to insufficient knowledge for performance prediction prior to AS-203 flight.

This experience has had a demoralizing effect on CCSD trajectory people and caused strained working relationships. Also, unnecessary duplication of work is being performed to save their money which does not contribute anything to improving mission success. We now have definite evidence that the work load within R&DO will also increase as a direct consequence of incentive contracts. These are typical of the objections which R&DO voiced during the development of these contracts.

2. Symposium on Navigation, Guidance, and Control: Mr. C. H. Gould, of the Control and Navigation Branch of OART in Headquarters, recently requested that Mr. Redus, of our Astrodynamics and Guidance Theory Division, present a paper at the Fourth Annual DOD, FAA, and NASA Symposium on Navigation, Guidance and Control. This year's symposium, to be held at Wright-Patterson AFB on October 11 and 12, will emphasize control systems. Mr. Redus will present a paper on "Advanced Flight Control Systems for Large Launch Vehicles." ✓

x) For CCSD's and Boeing's  
systems engineering support work  
in the Aero-Astro area.

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W Kelly notes  
8/1/66

MSFC ROUTING SLIP				
	CODE	NAME	INIT.	<input type="checkbox"/> A <input type="checkbox"/> C <input type="checkbox"/> T <input type="checkbox"/> I <input type="checkbox"/> O <input type="checkbox"/> N
1	DEP-A	Mr. Gorman		INFORMATION
2				
3				
4				

REMARKS

To be included in von Braun Notes of 8-1-66.



CODE	NAME	DATE
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MSFC - Form 183 (Rev. February 1961)

NOTES 8/1/66 JAMES

*By - Gorman  
Newby*

AS-203 FLIGHT EVALUATION ACTIVITIES: Detailed analysis of AS-203 mission flight data discloses that the Quality Meter did operate throughout flight and did provide useful data (when analyzed with the aid of other instrumentation data). Also, a possible performance deviation of the S-IB Propulsion Control System has been identified. Oscillations of approximate amplitude  $\pm .5$  degrees in pitch and  $\pm .3$  degrees in yaw at about 1.6 cycles per second were discovered between ignition and liftoff. If such an oscillation continued it could cause undesirable vehicle side motion just after liftoff. Control system stimulations may have caused the oscillations. Detailed analysis is in progress.

ABORT CONDITION IF J-2 FAILS TO IGNITE: During the OATS test July 26, a personnel error prevented the J-2 ignition signal from being transmitted. An abort followed with the LES still attached to the command module and service module. This is an unstable condition. Quite an exercise ensued and a program error was suspected. Analysis revealed that everything functioned as planned and that the mission rules properly covered the case. If J-2 ignition is not received by T + 10 seconds into time base 3, the computer jumps to time base 4 and the spacecraft separates 8.3 seconds later. Since the LES is not normally jettisoned until 25.5 seconds into time base 3, it would be still attached. For this reason the mission rules provide that if J-2 ignition is not received, the booster system engineer will request a command abort.

FINAL SA-204 DESIGN CERTIFICATION REVIEW (DCR) DRY RUN AND SA-202 PREFLIGHT REVIEW: We were forced to schedule the SA-204 DCR dry run August 2 and 3 in order to avoid conflicts with SA-202 activities later in the month. This precedes our SA-202 Preflight Review on August 4. This is an unfortunate crowding of calendars but I hope we can get adequate representation to make the two meetings effective. The situation is worsened by the fact that the SA-202 CDDT is scheduled during the period August 2 through 4.





NOTES 8/1/66 BALCH

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S-II Test Stand A-2 Refurbishment and GSE Modification - No major problems are anticipated at this time, and it is still expected that the facility, technical systems, and GSE will be ready for installation of the S-II-1 in the stand when it arrives at MTF. ✓

S-II-1 Stage - MTF representatives have been participating in the review of open items on the stage, recap of discrepancies, and other turnover activities at Downey. The stage was shipped Sunday morning, 7/31/66. ✓

S-II A-1 and S-IC Test Stands - On both the S-II A-1 stand and the B-2 position of the S-IC stand, the most critical problem affecting the timely completion of brick and mortar construction is the uncertainty of delivery dates for material from American Hoist & Derrick required for completion of both main and auxiliary derricks for both stands. Corps of Engineers plans to visit American Hoist & Derrick on August 2, 1966, to try to improve this situation. On the B-2 position of the S-IC stand, installation of the holddown arms is a pacing item. All four holddown arms have now been erected into position, but final alignment has not been accomplished, and welding has not been started. No major problems are anticipated. ✓

Notice to proceed has been given Boeing's subcontractor for MSE installation on the B-2 position of the S-IC stand. The subcontractor is on the job and is expected to commence work in the center pier on August 1, 1966. ✓

Negotiations on final cleaning package for piping systems on the S-II A-1 stand started on July 28, 1966. ✓

A change order to stage contract with S&ID providing for management assistance in the activation of the S-II A-1 stand has been forwarded to the MSFC Contracts Office for consummation and formal direction to S&ID. ✓

Labor Relations - On July 27, 1966, the recommendations of the President's Missile Sites Labor Commission for settlement of the disagreements between the IAM and the J.N. Travirca Company were put before the local IAM membership for referendum vote and ratified by a substantial majority. The company has also agreed to the recommendations, and no further problems are foreseen in finalizing the formal labor agreement between the company and the union. ✓

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NOTES 8/1/66 BELEW

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EXPERIMENTS: The X-ray Astronomy Experiment, S-027, has been approved by Headquarters and FY 67 funds have been received by MSFC. This effort is being coordinated with Dr. Johnson and is being expedited every way possible to meet the tight SA-210 flight schedule. ✓

RACK: A preliminary project development plan on the Racks to be supplied for the Lunar Mapping and Survey System is being forwarded to Dr. Gilruth and Dr. Mueller this week. It calls for the delivery of five flight articles and one test article with an FY 67 cost of \$817,000. ✓

ORBITAL WORKSHOP: On Monday, July 25, the MSFEB authorized Phase D procurement for the Orbital Workshop Experiment. The interesting portions of this Orbital Workshop portion of the meeting are as follows:

Dr. Mueller wanted to change the name of the Spent Stage Experiment and the SSES. These were changed the next day to the Orbital Workshop and the Airlock Module respectively.

The Air Force requested that the Orbital Workshop or 209 set aside 680 lbs. for DOD experiments. The three top candidates were described in a memo for record last week. The DOD also requested that one of the Air Force astronauts be flown as one of the crew members on AS-209. Dr. Mueller did not respond to either of these two requests concerning the astronaut or weight allocation.

ATM/LM INTEGRATION STUDY: The final GAEC report on their two month ATM/LM integration study will be given at MSFC on August 5, 1966. A widely distributed invitation to hear this report has been sent out. The outstanding problem in this area is to decide on any continuing GAEC effort desired by us. This is heavily dependent on the Headquarters' response to the George Low letter on use of LM. ✓

ATM EXPERIMENTERS' CONFERENCE: Astrionics and Research Projects were requested to organize an ATM experimenters' conference at MSFC within the next two weeks. It was agreed that Dr. Stuhlinger would extend the invitations and chair the initial meeting. Presently, because of the transportation situation it appears that the investigators will be coming to MSFC individually. The dates have not been set. ✓

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C-1 ENGINE A briefing on the C-1 Program was given to Dr. Mueller on July 25, 1966. Representatives from Headquarters, MSC and MSFC were present for the briefing. Program redirection was not indicated by Dr. Mueller. The development program is proceeding as originally planned. ✓

F-1 ENGINE Cost reduction received special emphasis in the recently completed (July 21) negotiations for the remaining engines and Production Support for the 15 vehicle Apollo Program. Pre-negotiation informal agreements on engineering manpower levels not only resulted in reduction in proposed effort, but also will result in further manpower reductions in existing contracts. Three engines, ten sets of thermal insulation and quality verification testing were dropped from the RFQ quantities due to better than anticipated success with the early stage buildup and static test. To maintain the necessary spare engines, scope was added to provide hardware and labor for engine rebuild or rehabilitation. ✓

Engine F-3017 (SA-502 Position 1) was tested for 36 seconds on July 18, in the MSFC F-1 single engine test stand to verify engine thrust recalibration. Preliminary evaluations indicate that the engine did not respond to reorificing and the performance was still high. Excessive vibration levels existed during start and mainstage in the gas generator and turbopump areas. The engine will be removed from the test stand for a more complete inspection of the gas generator and turbopump areas, pending a detailed analysis of test data. ✓

J-2 ENGINE The S-IVB stage was successfully acceptance tested on July 28. The first burn was for 153 seconds. The second burn was 295 seconds following a 90 minute simulated orbital hold. Preliminary data review revealed no discrepancies. ✓

The J-2 engine combination contract, NAS8-19, which was forwarded to NASA Headquarters for approval July 14, was unconditionally approved July 29. This contract covers, on a CPIF basis, both J-2 production and production support effort. ✓

A meeting was held at Test Division on July 25 to discuss the next action to investigate the RCC experienced on May 10 after a duplication attempt on July 21 was unsuccessful. A letter will be submitted to this office with P&VE and Test Division's recommendations.

The erratic operation of the spark exciter on J-2 engine J-2042 (S-IVB 502) has been further investigated. The cause of failure has been attributed to a leak in the spark exciter can in conjunction with a spark gap seal failure. The ECA package is pressurized with GN<sub>2</sub> to 25 psi. The exciter can is hermetically sealed with dry air at one atmosphere. The spark gap is also sealed in the exciter can with dry air to one atmosphere. It is concluded that the spark gap seal was broken during assembly. When the exciter can leaked it allowed the spark gap to be pressurized. This in turn caused the spark rate to decrease and the spark intensity to increase. ✓

An S-II Battleship firing was aborted Friday due to an erroneous gas generator overtemperature cutoff. On Saturday a successful 365 seconds mainstage test was conducted which included 240 seconds of maximum M/R operation (5.5/1.0) and a gimbal program. ✓

A successful all-systems test at the specified altitude condition of the J-2/S-IVB Battleship system in the J-2 test cell at AEDC was conducted on July 30-31, 1966. Facility problems were encountered, including failure of the GH<sub>2</sub> vaporizer (recharger), helium regulator malfunction, nonoperating valves, etc. These were corrected (except for the vaporizer), and the systems were operated to the point where an engine firing was approximated. The data derived from this test will be evaluated by ARO and MSFC (P&VE and Test Labs) preparatory to the initial hot test on August 6, 1966. MSFC Test Lab has agreed to loan AEDC a portable GH<sub>2</sub> vaporizer for the next test. The GH<sub>2</sub> bottles will be recharged this week. In the interim, the vaporizer manufacturer (Paul Chemical) is preparing a new unit (the boost pump) for shipment to AEDC. ✓

Will  
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9/15/66

FY 67 BUDGET PROGRAM

Letters have been sent to Chrysler Corporation Space Division and The Boeing Company outlining guidelines for reductions in photographic, documentation and reproduction services. Other Michoud support services furnished the prime contractors are under review and will be the subject of subsequent letters and discussions. ✓

VISIT OF HOUSE SPACE COMMITTEE

Messrs James Wilson and Joseph Felton, staff members of the House Space Committee accompanied by Capt. Robert Freitag and other representatives of NASA Headquarters visited Michoud on July 28 and 29 to review the S-IB program with Chrysler and the S-IC program with Boeing. It appeared that the group was well pleased with the presentations made by sub-contractor. ✓



NOTES 8/1/66 FELLOWS

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1. SA-501 Launch Operations Plan and Catalog of Tests: These two documents, prepared by KSC and submitted for MSFC approval, have been reviewed by the laboratories. It is the consensus that the documents are not acceptable as written. Neither one, nor the combination of the two, clearly indicates operations and tests which satisfy MSFC stated requirements. A meeting has been arranged with Launch Vehicle Operations by Ludie Richard for August 4, to develop an approach toward improvement of the two documents for acceptability. ✓
2. Conversion of Prime Contracts to CPIF: R&D Operations has been analyzing Boeing and Chrysler scopes of work in order to recommend technical incentive structuring to IO. That effort was nearing satisfactory completion, but a decision, July 21, by the Flight Mechanics Panel to limit mission planning for Saturn V vehicles after AS-504 and Saturn IB vehicles after AS-208 will require another review of technical incentives. Beginning with AS-505, only minor mission changes, which could be worked in during the last 90-120 days before launch, will be allowed. Missions beyond AS-208 are to be identical insofar as mission planning and mission documentation are concerned. The additional review of technical incentives is expected to delay the laboratories only a few weeks, and recommendations to IO should be made early in September. ✓
3. NASA Review of the MSFC Cost Reduction Program: Last week during a visit to the Center, Brooks Preacher of Mr. Webb's staff and Jim Constantino and Bob Mise, MSF Program Office, asked me for an informal briefing on the status and plans of the R&D Operations Cost Reduction Program. The briefing was favorably received by the Headquarters' representatives, and they were enthusiastic about our program to the point that they plan to invite other NASA centers to visit us and hear the same briefing. A formal review by NASA Headquarters and a report to Dr. Seamans on the Cost Reduction Program are expected about January-February. ✓
4. Movement of the S-IC-T Stage from the Test Stand to ME: Messrs. Cook, Heimburg, and Kuers decided last week to move the S-IC-T stage from the test stand to ME immediately, rather than have ME refurbish the stage in its vertical position on the stand. The S-IC-T stage will be modified so it can be used for facilities checkout of the MTF S-IC test stand for acceptance of the S-IC-4 stage. ✓



QD 8/1

1. S-IC-1 CHECKOUT: The S-IC-1 stage was not released from checkout July 30, 1966, due to the following: Fuel and lox level sensing systems operations are unstable. Power transfer switch is defective (chatters when going from internal to external power). The outboard lox cutoff timer is defective. The environmental control system cannot be verified because there is no documentation release to define flow requirements, pressure requirements, and test criteria. The lox tank pressure switch requires replacement. (This is an MSFC item.) There is currently no availability date for the switch. Fuel prevalve orifices require changeout, but are not available before August 1, 1966, and the timing requirements for these valves are not yet clearly defined. In addition to the critical items listed above, there are 28 missing components and 33 outstanding UCR's which should be cleared prior to completion of checkout; however, these latter items are not of a category to justify delaying transfer of the vehicle. The Boeing Company is informed of these problems and has been asked to assist in immediate resolution of the problems. Effort is underway to determine how much impact there is on the schedule. An assessment meeting is scheduled with Mr. Urlaub for Monday, August 1, 1966, at which time we should be able to establish a new release date. ✓
2. IU-204 ENVIRONMENTAL CONTROL MANIFOLDS: The set of manifolds installed in IU-204 are considered flightworthy in light of all available test data. Embrittlement of the tubing material, which is not detectable by X-ray or other non-destructive testing techniques, still exists and it is not known conclusively how aging or adverse environments may effect the welded joints. The manifolds, however, conform to all acceptance criteria, and tests on a limited number of samples have yielded good results. We are requesting that P&VE Laboratory reconfirm acceptance criteria in light of the embrittlement conditions, which will apparently continue to exist until such time that the vendor changes his weld procedure. ✓
3. ELIMINATION OF STATIC FIRINGS: Comments on elimination of static firings, which were invited on NOTES 6-6-66 JAMES (copy attached), are too long for inclusion in the NOTES and have been forwarded to you by memorandum with copies to Messrs. Weidner and James. ✓

ATTACHMENT: NOTES 6/6/66 JAMES

968/1

1. IU-500FS BATTERY FAILURE: (\*Reference Item 4 Notes of 7/18, reprinted below). The 500FS IU battery that burned was shipped to the battery manufacturer and arrived there on 7/21. An ASTR representative was there to participate in the investigation.

The possible causes of the battery failure have been discussed with the manufacturer and other battery experts and the consensus is that there are two possible causes. One is an internal cell short and the other is a short to the magnesium casting possibly through a cracked cell case. Either of these cases could have been detected through monitoring the open circuit voltage, the battery temperature, and the battery current.

Since the battery in question was built, the manufacturer has improved his fabrication and assembly procedure and added several in-process quality control checks. Furthermore, it is believed that a modification to the checkout procedures on the battery after activation to include an insulation resistance test and to monitor open circuit voltage prior to installation on the vehicle will give definite indications of any possible problems of cell shorts. In addition, the open circuit voltage, temperature, and current should be monitored after installation on the vehicle. Provisions have been requested for monitoring these parameters in the blockhouse during the countdown. ✓

Methods of extinguishing a battery fire, should it occur on the vehicle will be investigated. However, this would probably require a fairly complicated system. ✓

On 7/28 the three batteries that had been previously activated for the 500FS test were removed from refrigerated storage and prepared for the test. A short was discovered in one of the batteries (one cell to battery case). The battery vendor is now conducting an analysis to determine cause of this condition which would not have caused a problem without progressing to a much lower impedance between cell and case. ✓

The 500FS test was completed and the four batteries that were installed were operated for 9.5 hours well within the voltage limits. ✓

\*From 7/18/66 Notes

4. IU-500FS BATTERY FAILURE: A battery failure occurred on one of the 500FS IU batteries after installation but before power transfer. The failure is being investigated on the site and the battery will be shipped back to the manufacturer for a complete study.

The cause of the failure cannot be determined at this time. However, the data available indicates an internal short or a deterioration of the separator material in one of the cells.

There was extensive damage to the S-IU-500FS. Some IU equipment, based on a visual observation only, had been found to be damaged and must be replaced; such as 20 wire cables, several flat cables, cold plates, and environmental flex hose. The repair will take 1 to 3 weeks and will correspondingly increase our operational cost.

As a result of the occurrence, we are also investigating redundant use of batteries to a greater extent as before; in addition, we will consider protection methods against battery overheating and fire hazards. ✓

9/8/1

S-IC

Buildup of the S-IC-T on the test stand continued. The fourth F-1 engine and two thrust chamber skirts were installed on the stage. Four lox pre valve flowmeters were removed and the pre valves reinstalled. On Thursday, all firing preparations ceased and the stage was prepared for removal. The stage was removed from the Saturn Static Test Facility on Friday and returned to ME Laboratory. ✓

S-IVB (SACTO)

On Thursday, July 28, 1966, a successful acceptance test firing on Vehicle 502 on test stand Beta 1 was completed at the Sacramento Test Center. No major discrepancies occurred and preliminary data indicates that all test objectives were accomplished. ✓

F-1

F-1 engine S/N 4017 from S-IC-2 was fired (FW-047) on July 25, 1966, for a mainstage duration of 36 seconds. This engine did not respond to re-orificing for lower performance. There was also evidence of "buzz" in the gas generator for the first 15 seconds of this test which caused unusually high gas generator/turbine vibrations and extensive instrumentation failures on those components. This engine did not exhibit this phenomenon characteristic on the stage firing. Single engine test conditions were similar to stage test conditions by intent. Because of these unknowns, engine was removed on July 29, 1966, and shipped to ME Laboratory for disassembly of hardware and inspection of gas generator injector, etc. When complete, we will again attempt to calibrate by hot firing. Engine S/N 2010 was installed on July 29, 1966, and will be calibrated prior to installation on S-IC-T. ✓

GSE

Testing has been successfully completed on Arm 4 and Arm 5, (S-II Intermediate and S-II Forward). These arms will be removed from the test area this week for refurbishment and subsequent shipment to KSC the first of September. Flight umbilical testing on Arms 6 and 7 (S-IVB Aft and S-IVB Forward) should be completed by August 6. This will complete the testing for all 501 arms except tail service masts which will not be completed until the latter part of August. ✓

A program review was held this past week between KSC and MSFC personnel. A delivery slip of October 1, for the tail service masts, was acceptable to KSC. KSC personnel will return to Test Laboratory this week to continue detail discussions on hardware and procedural changes made during testing as well as degree of service arm refurbishment to be accomplished by Test Laboratory. ✓

NOTES 8-1-66 HOELZER

8/28/11

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COMPUTER SCIENCES CORPORATION STAFFING: CSC's recruiting progress to date is as follows: Total acceptances 365. Of the 365 acceptances, 181 are professional and 184 non-professional. CSC has 240 General Electric acceptances and 125 acceptances from other sources. These are acceptances not on board. Computation Laboratory is satisfied with this progress. ✓



AS-203 FLIGHT EVALUATION ACTIVITIES: Detailed analysis of AS-203 mission flight data discloses that the Quality Meter did operate throughout flight and did provide useful data (when analyzed with the aid of other instrumentation data). Also, a possible performance deviation of the S-IB Propulsion Control System has been identified. Oscillations of approximate amplitude  $\pm .5$  degrees in pitch and  $\pm .3$  degrees in yaw at about 1.6 cycles per second were discovered between ignition and liftoff. If such an oscillation continued it could cause undesirable vehicle side motion just after liftoff. Control system stimulations may have caused the oscillations. Detailed analysis is in progress. ✓

ABORT CONDITION IF J-2 FAILS TO IGNITE: During the OATS test July 26, a personnel error prevented the J-2 ignition signal from being transmitted. An abort followed with the LES still attached to the command module and service module. This is an unstable condition. Quite an exercise ensued and a program error was suspected. Analysis revealed that everything functioned as planned and that the mission rules properly covered the case. If J-2 ignition is not received by T + 10 seconds into time base 3, the computer jumps to time base 4 and the spacecraft separates 8.3 seconds later. Since the LES is not normally jettisoned until 25.5 seconds into time base 3, it would be still attached. For this reason the mission rules provide that if J-2 ignition is not received, the booster system engineer will request a command abort. ✓

FINAL SA-204 DESIGN CERTIFICATION REVIEW (DCR) DRY RUN AND SA-202 PREFLIGHT REVIEW: We were forced to schedule the SA-204 DCR dry run August 2 and 3 in order to avoid conflicts with SA-202 activities later in the month. This precedes our SA-202 Preflight Review on August 4. This is an unfortunate crowding of calendars but I hope we can get adequate representation to make the two meetings effective. The situation is worsened by the fact that the SA-202 CDDT is scheduled during the period August 2 through 4. ✓

NOTES 8/1/66 JOHNSON

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Negative Report .

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1. Manpower Utilization Study in ME Laboratory: We have conducted a study during the last few months on the utilization of Wage Board personnel in ME Laboratory. The following data reflect on the changes during recent years:

	<u>1960</u>	<u>1966</u>	<u>Reduction (%)</u>
Number of Productive Wage Board	415	276	33
Number of <u>Non</u> -Productive Wage Board (Warehousemen, tool cribs, crane operators, other shop support)	<u>170</u>	<u>73</u>	<u>57</u>
TOTAL Wage Board in ME	585	349	40

I am very concerned about any further reduction of our productive Wage Board personnel. An analysis of the productive Wage Board requirements for the present and committed workload in our shops shows that the present skill mix is in the proper balance; i.e., that we have approximately the right number of workers in each of the many various skills and specialities needed for the accepted work. Therefore, if a single man in one skill leaves and if we are not permitted to replace him, then serious delays in hardware deliveries may result. ✓

2. Human Centrifuge Gondola Test for MSC: The test fixture for support of the Gondola in the Autoclave has been received and also the Gondola itself has arrived. It is a 12 foot spherical honeycomb structure. However, some slight damage of the Gondola in shipment has been detected. We are now in the process of repairing the damage in full coordination with MSC personnel. The test is delayed until the end of August or beginning of September because of this repair. ✓



1. SA-203 EXPERIMENT RESULTS - Results of the SA-203 experiment will be presented to representatives of Lewis Research Center, Manned Spacecraft Center, General Dynamics Corporation, and Douglas Aircraft Corporation at MSFC on August 3, 1966. ✓

Bill L.  
Request  
a 30-min  
tech.  
briefing  
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2. PAYLOAD MODULE RACK - Preliminary design of the RACK is 80% complete, and layout of the docking collar is being studied. The Research and Development Plan is ready for signatures with August 5 planned distribution date. The scope of work and technical specification from MSC are being reviewed. Meetings are scheduled for August 1, 2, and 3 with MSC, MSFC, KSC, NAA, and 8 contractors to identify and describe all interfaces associated with MSFC's support of MSC in the Lunar Mapping and Survey System Mission (Payload Module). Travel restrictions have become critical to the schedule of end item delivery for this project.

3. NUCLEAR GROUND TEST MODULE (GTM) - We have established working contacts with SNPO, Headquarters, and Cleveland, and arranged working meetings on NERVA Engine propellant valve between P&VE and SNPO-C. This valve is proposed for use on GTM and will reduce GTM funding requirements significantly. ✓

4. PROPELLANT STORAGE CONFERENCE - Approximately 40 papers have been received in response to a request for papers for the conference on cryo-propellant storage in space, scheduled to be held at this center in October 1966. Approximately 24 papers can be presented in the two-day conference. ✓

5. MOBILITY TEST ARTICLE (MTA) STATUS - (a) Bendix MTA: Testing of the Bendix MTA has begun at Aberdeen Proving Ground (APG). Continuing electrical problems could drastically affect the test program by extending schedules. (b) General Motors (GM) MTA: Assembly of the GM MTA is almost complete and the vehicle is now being checked out at the Santa Barbara, California, facility. ✓

What's  
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6. PROJECT THERMO - The Phase B study contract on Project Thermo will be awarded to Douglas Aircraft Corporation. It is expected that the contract will be signed on July 29, 1966. This study is one of several closely related studies and is required for project definition within 6 months. ✓



NOTES 8-1-66 RICHARD

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Negative Report

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1. SA-501 Vehicle Status:

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- o S-IC-1 Stage - Post captive checkout was not completed on Saturday, 30 July 66 as scheduled. Delay due to various hardware and checkout problems. Meeting between Stage Project Office and R&DO scheduled for today, Monday, 1 August 66 to review problems. We will keep you posted as to the status and possible impact on scheduled ship date to KSC of Monday, 29 August 66. ✓
- o S-II-1 Stage - shipped from Seal Beach, at 8:00 am, PDT, Sunday, 31 July 66. Estimated to arrive at Michoud on Saturday, 13 August 66, and on dock MTF on Sunday, 14 August 66. ✓
- o S-IVB-501 Stage - removed from checkout position of Vertical Checkout Laboratory on Friday, 29 July 66. Modification work to continue in horizontal position, shipment to KSC is scheduled for Friday, 12 August 66. ✓
- o S-IU-501 Unit - Checkout completed on Friday, 29 July 66. Manifold exchange and modification kit installation currently underway. Final checkout scheduled for Friday, 12 August 66, with shipment to KSC planned for Friday, 19 August 66. ✓

2. Voyager Program: During a meeting between OSSA and JPL on Friday, 22 July 66, four firm ground rules were established which will allow JPL to prepare a program estimate for the 1973, 1975, 1977 and 1979 missions. This will be the 14th program estimate this year and hopefully the final one. The ground rules are:

- o A Standardized Spacecraft (orbiter) for all missions. ✓
- o A Standardized Capsule (lander) for all missions. ← Difficult B
- o Two Planetary Vehicles (Spacecraft and Capsule) on one Saturn V for each mission. ✓
- o The Capsule will soft land on Mars (a la Surveyor) on all missions. ✓

These firmly fixed ground rules will allow JPL to vary the other parameters involved (weights, time of flight, Mars orbital parameters, costs, schedules, etc.) to attain a feasible program estimate and proceed, hopefully, without the many perturbations that have hampered them over the past year. ✓

Voyager Program funding was increased from \$10 million to \$23 million in FY67. ✓ A minimum of \$60 million will be available in FY68. ✓

B 8/7

NOTES 8/1/66 SPEER  
9/29/11

1. FLIGHT OPERATIONS PANEL: The panel met at MSFC on July 27. Mr. Christensen attended. The subject of In-flight Support to MCC-Houston was discussed upon request by OMSF. The positions taken by MSC, KSC and MSFC have not changed from the agreements reached by the panel about three years ago and the need for this support was re-affirmed by MSC. Headquarters is now expected to take a position on the depth of the KSC in-flight support. On other items, the effect of the presently planned alternate missions resulting from in-flight contingencies on flight operations was discussed at length by the panel. Ground commands will be utilized to initiate some of these real time alternate missions. ✓

2. AS-202 PRELAUNCH TESTS: Personnel Locator Support through LIEF was made available for the "Overall Test-Plugs In" which was successfully completed on July 23 and for "Overall Test-Plugs Out" which was initially run on July 26 and repeated on July 27 and 28. No support requests were received. The first Plugs Out Test was scrubbed due to an early S-IVB cutoff which was traced to a procedural error (failure to throw the S-IVB main stage switch). The second run of the Plugs Out ended at about T + 10 seconds in an EDS abort because the S-I Thrust OK indications were lost. The test was re-run on July 28 and successfully completed, although during the first count no liftoff signal was received due to a spacer (test article only; will not be in for launch) in the IU umbilical. ✓

3. HOSC ADDITION: The proposed 100 ft. single floor addition (reference Notes 7/25/66 Speer copy attached for Dr. von Braun) has been judged too costly. As an alternate a 3,200 sq. ft. second floor addition over the HOSC Main Conference Room is being studied. It appears that this solution will be feasible. A new project request is being written and will be submitted this week. In the interim, design studies will proceed to assure adequacy, minimum cost and timely completion. ✓



NOTES 8-1-66 Stuhlinger

B217

1. PEGASUS: As of July 30, the first anniversary of Pegasus III, Pegasus II and III continue to operate properly, although the number of active panel groups considered valid continues to diminish. Pegasus II continues to expose 39.049 m<sup>2</sup> (twelve panel groups) of the 0.4 -mm panel thickness and 4.655 m<sup>2</sup> (five panel groups) of the 0.038 -mm panel thickness to meteoroid penetration. Pegasus III exposes 99.164 m<sup>2</sup> (twenty panel groups) of the 0.4 -mm panels and 6.517 m<sup>2</sup> (seven panel groups) of the 0.038 -mm panels. The entire +Y wing of Pegasus I is presently considered inactive with questionable data now being received from the -Y wing. ✓

As of July 30, the 0.038 mm panels have recorded 991 valid events in 5955 m<sup>2</sup> days for a flux of 0.166/m<sup>2</sup> day. The 0.2 mm panels have experienced 60 events in 3588 m<sup>2</sup> days for a flux of 0.0167/m<sup>2</sup> day. The 0.4 mm panels have recorded 305 valid penetrations in 72,602 m<sup>2</sup> days for a flux of 0.0042/m<sup>2</sup> day. The satellites continue to show remarkable consistency in their results. ✓

2. LUNAR SCIENCE: Mr. Culbertson had requested RPL to work out details for several 14-day lunar surface exploration traverses (AAP-Program), and also for later missions of more extended duration (LESA-type missions). We will give Mr. Culbertson a report of our work on August 4 or 5 at MSFC. ✓

3. ATM: Dick Forsythe, Headquarters Program Manager for ATM, requested RPL to establish a working contact with the five principal investigators of the ATM project (Goldberg, Purcell, Eddy, White and Giacconi) as soon as possible. In conjunction with Bill Horton's and Rein Ise's offices, we will arrange for visits of the five investigators this week. ✓

4. LUNAR DRILL: The rotary percussive lunar drill (Northrop) has been delivered to MSFC and the rotary drill (Westinghouse) is nearing completion at the contractor's facility. Both of these engineering models will require an extended testing and modification program before we reach the prototype hardware stage. Actually we are very satisfied with the results of this first year's effort, but much work remains to be done. ✓

Test stands have been built in Building 4481 (high bay area) for a number of basic tests with the Northrop drill. The Westinghouse drill is being tested in Baltimore. We are using our support contractor (Brown Engineering) to assist us in the monitoring and conduction of these drill tests. ✓

NOTES 8-1-66 WILLIAMS

8/1/66

B8/7

1. Shelter/Taxi vs Augmented LM: Potential payload lists have been developed for a high cost and low cost operation for the Shelter/Taxi approach, as well as three separate payload lists for the augmented LM approach dependent upon lunar surface stay time with the augmented LM. Cost and schedule work has been completed on the Shelter/Taxi and will be completed on the augmented LM the middle of next week. The first inter-Center coordination meeting will be held at MSC on August 2. At this time, GAEC will present several concepts associated with the augmented LM. ✓

August 8, 1968

# OFFICE OF DIRECTOR - MSFC

CODE	NAME	INIT.	<input type="checkbox"/> ACTION	<input type="checkbox"/> INFORMATION
	Dr. Van Braun			
	Dr. Geissler			

REMARKS

FY0 B 8/28

Reference your question about recruiting practices of Computer Services Corp (on Geissler's notes of 8/8/66.) Bill Davis looked into the matter and summarized his actions in the attached memo.

Hewley  
8-23-66



CODE	NAME	DATE

MSFC - Form 495 (Rev August 1963)

16  
8-29  
7.8-29

File 8/8/66  
NOTES

Mr. Gorman, DEP-A

August 12, 1966

Assistant Director for Procurement and Contracting, AST-P

CSC Recruitment of Personnel

We find that three Northrop employees applied to CSC and were offered employment; however, all three declined. There is no trace of a problem now with Northrop losing personnel to CSC.

There has been a significant problem with Lockheed programmers transferring to CSC at salary increases ranging from \$600 to \$1200 per year. Attached is listing of the employees and salary structure. This problem has been resolved by CSC commitment to refrain from further recruitment of Lockheed employees.

15/W.D.

Wilbur S. Davis

1 Enc:

As stated



8/9 3:00

~~with~~ information regarding employment of Lockheed personnel programmers by CSC.

We have ~~about~~ three different groups of names and salaries, as follows:

Hired Early in July

<u>Name</u>	<u>Current Salary</u>	<u>Salary Offered</u>
Kilgo	\$14,400	\$15,540
Nerville	7,280	7,800

Acceptances Received

<u>Name</u>	<u>Current Salary</u>	<u>Salary Offered</u>
Peete	\$ 8,320	9,540
Berry	10,200	11,400
Boykin	11,500	12,000
Crow	8,838	10,020
Daugherty	10,752	12,000
Sherer	10,500	11,820
Statgs	7,800	8,640
Taylor	12,000	13,260

Offers Outstanding

<u>Name</u>	<u>Current Salary</u>	<u>Salary Offered</u>
Chambers	\$10,452	\$11,450
Howerton	8,729	9,600

CSC represented that these people reported to them looking for work. They have assured that no further offers to Lockheed personnel will be made.

The current salary is as reflected on CSC records and as represented by the applicants.

This information was obtained from Jim Colvin of CSC Personnel Office. If you need more information, please let Mr. Wood know.

*James*

B<sub>2</sub>/16

1. Environmental Factors affecting Apollo/Saturn V Launches: Bellcomm recently contacted our Aerospace Environment Division to obtain natural environmental data as input to a study relating launch probabilities to length of launch window and number of days in launch opportunity. Inasmuch as we were starting a similar study, we agreed to direct our analysis to provide Bellcomm their desired information as well. Study results will show how the environmental conditions influence the probability of successful launch for a lunar landing mission. ✓

2. Recruitment by Computer Services: The recruiting practices of Computer Services Corporation (CSC) are beginning to interfere with the performance of our support contractors. CSC is recruiting heavily throughout the Huntsville area and has succeeded in hiring some people whose knowledge was essential to some current investigations. The adverse aspect of this is that to a large extent these people are far more valuable to us in their present employment because of their knowledge of and experience with the specific programs on which they are working. In some cases, critical programs will be affected. ✓

3. Stratoscope (Balloon Telescope Project): The Physics & Astronomy Office of OSSA has asked MSFC to convene a review committee on Stratoscope II program. The program is sponsored by NASA, National Science Foundation, and Office of Naval Research. The objective is to fly, by balloon, a 36-inch telescope at about 80,000 feet. Flight duration is one night. The last three flights have failed for various reasons. One failure was attributed to atmospheric monitoring and prediction, as related to design-operational limits. Members of our Aerospace Environment Division, Mr. W. W. Vaughan and Mr. J. R. Scoggins, have been asked to serve on the review committee. The results of the review committee are expected to be published in late November. ✓

4. Space Environment Seminar: The July 27 Space Environment Seminar which was arranged by our Aerospace Environment Division, with the cooperation of Illinois Institute of Technology (IIT) Research Institute, was conducted by Dr. McCormac and Mr. Sears of IIT. Topics discussed were trapped radiation and aeronomy. Considering the length of the lectures, attendance was quite good. 50 people attended the morning session and 30 attended the afternoon session. ✓

Dave  
Newby  
Can  
you  
help?  
B

# OFFICE OF DIRECTOR - MSFC

CODE	NAME	INIT.	<input type="checkbox"/> ACTION	<input type="checkbox"/> INFORMATION
DIR	Dr. von Braun	KB		
Final	B 8/28			

## REMARKS

SUBJECT: Panel Activities - Weekly Notes  
8/8/66 - Richard

I just want to confirm to you that we had decided to keep the present panels intact for AAP. This will be discussed and finalized at the next PRB, probably August 30 (date is not quite fixed yet). There will be the final decision. I do not believe that this decision will be different because MSC, KSC and MSFC had agreed that we want to keep the panel structure intact. We might abolish here and there a panel or a sub-panel and establish here and there an additional panel or sub-panel.

*E. Rees*

E. Rees  
August 22, 1966



CODE	NAME	DATE



NOTES 8/8/66 RICHARD

B 8/16

Eberhard

to keep

panels

intact for

AAP, aren't we?

B

Panel Activities : General Phillips has requested that each panel present to the Panel Review Board (August 22) their future plans. Each panel is to review its scope statements with proposed scope changes, responsibilities, subpanel operations, memberships, etc., for FY-67 and beyond. A premeeting is being held for Mr. Rees on this and other PRB matters on August 16, 1966. ✓

Saturn "Soft Spot" Areas: In the initial effort to list and organize the "soft spot" areas of our Saturn programs, we have developed with the laboratories a list of over 200 items that may be in this category. We will filter out priority items and essential internal activities to define the required steps to be taken next. The intent is to do as much as can be done on these items in R&D Operations, within our resources. ✓ The cases requiring action outside R&D Operations will be individually documented (and coordinated with the affected organizations) for final management decisions. ✓

Wiley note

NOTES 8/8/66 BALCH

B 8/16

S-II Test Stand A-2 - Facility, technical systems, and GSE are still expected to be ready to support the arrival of the S-II-1 stage at MTF about August 14, 1966. ✓

S-II-1 Acceptance Criteria and End Item Test Plan - In meetings of representatives from the S-II Stage Office and R&DO elements, MSFC, NASA and S&ID, MTF, and S&ID, Downey, held this past week to review S-II-1 acceptance criteria and End Item Test Plan, four of the five acceptance specifications under consideration were approved for technical content. Only items still to be resolved are the one remaining acceptance specification and the DOP's requiring NASA approval. ✓

S-IC Test Stand - Final preparations are underway to start welding two of the four holddown arms in place. This work is to be carried on continuously for six days each week, using two 12-hour shifts. Estimated completion date for all four holddown arms and actuators is September 27, 1966. ✓

Corps of Engineers made satisfactory arrangements with American Hoist and Derrick for delivery of material required for main and auxiliary derricks. Last of material required for auxiliary derrick is now to be delivered by August 17, 1966. Last of material required for main derrick is promised about three weeks later. ✓

S-II Test Stand A-1 - S&ID has begun staffing to provide management service in connection with the activation of the S-II A-1 stand in accordance with the contract change order consummated this past week. ✓

Corps of Engineers obtained satisfactory promise dates from American Hoist and Derrick for delivery of material required for main and auxiliary derricks. ✓

Labor Relations - Formal labor agreement between the IAM (Machinists) and the J.N. Travirca Company based on the terms proposed by the President's Missile Sites Labor Commission was concluded on August 4, 1966. ✓

Land Management - A request by the Mississippi Power Company to buy 17.5 acres of land in the MTF Buffer Zone for a 230/115 KV step-down substation has been referred to Industrial Operations with recommendation that the request be approved as an exception to our general policy of not disposing of fee-owned land in the Buffer Zone until land acquisition cases pending in court are settled and land use plans are finalized. ✓



B 2/10

# Workshop  
right?  
B

EXPERIMENT PROGRAM: Held a 2-day meeting with MSC covering the various aspects of the experiment program. Several ad hoc sessions were spun off from this meeting. A list of experiments was selected. ~~For the #~~ This list will comprise the package that will be presented to the September MSFEB. A tremendous effort by MSFC will have to go into these in the next few months on two counts; (1) because we are the lead Center, and (2) the AS-209 schedule is very short. ✓

What's that?  
B

LM & SS SYSTEM: A forward movement of the payload module mounting point in the Rack is being considered to accomodate power supply module capable of alternate LM & SS missions of 7, 14, and 28 days.

An analysis of the dynamic environmental capabilities of the payload module versus the imposed environment in the Saturn V vehicle during max. Q indicates that shock mounting may be required in the payload module or rack to accomodate the imposed loads. This area was discussed in meetings with the payload module contractor last week and will be discussed further with MSC this week. ✓

ATM/LM INTEGRATION STUDY: Grumman Aircraft Engineering Company (GAEC) presented their final study results from the ATM/LM integration study that they have performed for the last two months. Their study showed that it is conceivable from an expendables point of view to modify the Apollo LM to a 28-day duration ATM/LM at the Cape. Of particular interest were the following points:

a. GAEC recommended incorporation of a secondary structure below the LM descent stage to carry the majority of ATM related hardware such as the ATM package itself, the CMGs, and the electronics. This concept suggests that the descent stage can readily be exchanged with a complete rack in accordance with the Marshall concept. ✓

b. Incorporation of a solar cell based electrical power system held the total mission module weight to 11,500 pounds suggesting that there is some possibility for launching both the CSM and LM/ATM on one launch vehicle. ✓

c. However, incorporation of large solar arrays (300 sq. ft.) decreased the LM/ATM ballistic coefficient to where station keeping becomes a significant problem. For example, a relative drift of one mile in six hours was calculated. This also suggests that a tethering concept would not be practical since the tether would be continuously in tension. ✓

B 8/10

H-1 ENGINE The 205K H-1 qualification engine hardware display will be available for review by the government on August 9, 1966.

Engine H-4051 has been selected for flight verification testing in support of the SA-204 launch vehicle. This engine will be delivered to Rocketdyne about September 1, 1966, and testing is scheduled for completion that month. ✓

J-2 ENGINE The pressure actuated control valve that allows the gas generator valve to close at engine cut-off will be replaced on AS-202. The new valve assures against valve diaphragm damage and consequent loss of helium control pressure. ✓

The formal Qualification II (230K engine) engine system demonstration test series was begun Thursday, August 4, with two short duration tests. Two full duration (470 seconds) tests and a single 5 seconds test were accomplished Friday, August 5. Total test and time, including acceptance tests, are now 10 tests and 1753 seconds. Qualification goals are 30 tests and 3750 seconds. ✓

The initial test at AEDC was aborted after 18 hours of "air-on" time Saturday, August 6. At T-1 second, the test was terminated when the facility altitude pumping equipment partially shutdown, allowing a 7 PSI pressure rise in the cell. The next attempt will follow planned test cell facility maintenance, probably within the next ten days. ✓

C-1 ENGINE The operating characteristics and durability testing was continued. As of July 27, 1966, a total of 1,847 tests have been conducted accumulating 113,049 starts with 52,179 seconds of hot firing time. One S-IVB quadredundant valve engine has accumulated 3,952 seconds of hot firing time with 7,300 starts. The quad valve testing was conducted at propellant temperatures of 20, 70, and 130°F. A bi-propellant valve equipped engine has accumulated 12,518 seconds hot firing time with 44,746 starts. It is of significance to note that appreciable time is now being accumulated with elevated propellant supply temperatures, where instability had been more prevalent. ✓

The first candidate porous element injector configuration (designated as oxidizer injector manifold vapor snubber) to be used to suppress the formation of combustibles within the manifold, has been fabricated and cold flow tested. This injector will be evaluated to determine the effect of the porous element on normal combustion efficiency of the engine. Test will then be made under the most severe ignition attitude (nozzle-up) and altitude conditions. It is planned to evaluate additional elements having variation in porosity. ✓

F-1 ENGINE The formal F-1 engine Qualification Demonstration Series was started on August 1, 1966, on two F-1 engines selected from production. Two tests have been conducted on the endurance engine at 165 seconds duration each. Post test inspection after the second test (total time including acceptance testing 580 seconds) revealed erosion on one of the inner radial baffles about 1" wide and 1½" long and 3/8" deep located adjacent to the lower coolant passage. The prime suspected cause is a metal particle found lodged in one LOX orifice.

The previously reported high pressure fuel line boss failure on R&D engine 033 has been investigated in detail by Rocketdyne and MSFC engineers with a conclusion that excessive vibration loads are being imposed by a stage gimbal actuator supply line, recommendations for corrective action will be made within a few days, but at this time it is considered to require a mandatory change for SA-502 and subs.

Following the gas generator instability reported last week on Engine 4017 of the S-1C-2 Stage, the critical components have been inspected and no major hardware damage or instability cause was found. The engine will be reorificed in an effort to prevent the occurrence of mainstage pressure oscillations and retested at Test Laboratory. Transfer of S-1C-2 Stage to Qual Laboratory will occur with the engine not installed, and a two day slip in Qual Laboratory internal schedule will result when the engine is reinstalled. ✓



B8716

S-IC-3

Post Manufacturing Checkout (PMC) reporting schedules have indicated a September 22, 1966, completion date; however, this has been revised to a checkout completion date of August 23. This will allow the Simulated Static Firing (SSF) to be completed by August 23. During the interim period from August 23 to the September 25 shipping date to MSFC, several Production Revision Records (PRRs) and Engineering Change Procedures (ECPs) will be incorporated. The change-out of the prevalves originally scheduled to be accomplished at R-TEST will now be accomplished before shipment. It is also planned that the new 60B servactuators will be changed out prior to shipment of the stage for static firing. ✓

S-IC-4

The stage left the factory August 5, 1966, (on schedule) for Stage Test Facility (position #2) for Post Manufacturing Checkout. ✓

S-IC-5

The thrust structure is in the VAB and component installation is progressing on schedule. The fuel tank, LOX tank, intertank and forward skirt are complete and awaiting build-up operations. ✓

S-IC-6

The thrust structure is complete and is undergoing inspection in the pick-up position. The intertank is 98% complete; the forward skirt is complete; the fuel tank has been pressurized and is in its shakedown and final cleaning phase. The close-out weld has been made on the LOX tank. ✓

S-IC-7

The thrust structure is approximately 25% complete. Both fuel tank and lower LOX bulkhead have been assembled and all skin rings for the build-up of the tanks have been fabricated. ✓



NOTES 8/8/66 FELLOWS

B 8/16

Configuration Management Accounting System: In a continuing effort to reduce cost and manpower utilization, wherever this can be done without impairing mainstream effort, we in concert with IO have been critically examining Configuration Management accounting requirements and associated expenditure of resources. We have reached a tentative agreement with IO to eliminate about 75 percent of the formal accounting requirements from this system. We will retain and concentrate on the specification change data required to support KSC vehicle systems requirements. Internal MSFC management data will be added to the accounting system when clear and firm requirements are established mutually by IO and R&DO. Cooperation among the several organizations in both Operations has been excellent during the extended analysis of the Configuration Management accounting system. ✓

B2/6

1. Environmental Factors affecting Apollo/Saturn V Launches: Bellcomm recently contacted our Aerospace Environment Division to obtain natural environmental data as input to a study relating launch probabilities to length of launch window and number of days in launch opportunity. Inasmuch as we were starting a similar study, we agreed to direct our analysis to provide Bellcomm their desired information as well. Study results will show how the environmental conditions influence the probability of successful launch for a lunar landing mission. ✓

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Dave Newby

Can you help?

B

B 8/16

1. S-IC-1 CHECKOUT: Checkout of the S-IC-1 stage has been extended to August 9, 1966. This extension will not allow correction of all deficiencies; some defective components, design deficiencies, and rework will be transferred with the stage to KSC. The main objection to these circumstances is that in some cases there is no proven fix (redesign) established. ✓
2. S-II PROGRAM: S-II-1 was shipped from Seal Beach on July 31, 1966. Only three of the 21 cracks discovered on S-II-1 required the aluminum circular patch on the outside of the LH<sub>2</sub> tank opposite the cracked area. The circular insulation plug that was removed to enable attachment of the patch was not replaced so that further evaluation of the fix could be made at MTF. Thirty components remain to be qualified for S-II-1. Twenty-three of these are in criticality categories I and II. ✓
3. F-1 ENGINE QUALIFICATION: One test has been conducted on the endurance engine F-5037. Test objectives were: engine performance, start/shutdown, thrust alignment, heat exchanger performance, and thrust OK pressure switch output signal. All objectives were met, except heat exchanger performance. Data was not applicable from this test due to a facility malfunction. One test was conducted on the environmental engine, F-5039. Primary objective was to demonstrate engine performance after a sixteen-hour cold soak at less than 28°F with insulation installed. All objectives were met. ✓
4. RCA-110A COMPUTERS: Since the installation of reworked Printed Circuit Boards in the computers on VLF-34 and VLF-37, there have been very few parity errors experienced on these machines. The LUT (for 39-1) computer experienced some parity errors during breakdown of the cooling system for the computer. When air conditioning equipment was repaired parity errors ceased. ✓

D.F.

I hope you  
are not  
"washing  
your  
hands"!

Do you  
mean to  
say that  
you feel  
uneasy  
about  
SIC-1?

B



B 5/16

1. IU-500FS BATTERY FAILURE: (Reference Notes of 8/1, Copy Attached)\*. The battery failures that occurred on the 500FS test have been determined to have resulted from cracked cell cases. Since the battery burned on July 13, 1966, three additional batteries have been set aside due to a high voltage measured between the negative power pin and the battery casting. One of these batteries has been taken apart and cell no. 17 had a cracked case.

The most probable cause of the cracked cell case has been determined to be the high vacuum pulled on the cell case during the activation procedure. The particular cell that cracked was in the same location in all cases and is not supported on the side where the crack occurred. Laboratory tests have shown that the cell case without support will crack under a pressure differential of approximately 15 psi.

This type of failure is very easily detected after activation and sufficient soak time by measuring the voltage between the power pins and the casting. In order to minimize the probability of this type fault reoccurring and to detect it in the event it does occur, the following requirements have been added to the activation procedures for all batteries (starting with AS-202): (a) Limit the vacuum pressure during activation to 7 psi. (b) Allow the battery to stand 4 hours before stabilization load test and check for voltage between power pins and case. The measured voltage should not exceed 250 mv. (c) Refrigerate IU batteries to lower temperature and recheck voltages immediately following the load test. (d) Recheck voltages just prior to connecting the power cable. (e) Monitor voltage, current and temperature during countdown.

A design change in the IU battery package will be made to correct the deficiency of the cell case support prior to the manufacture of any new batteries.

2. LEM RELAY EXPERIMENT: NASA Headquarters has provided \$145K for a feasibility study of a LEM relay experiment. This experiment was conceived by Mr. Sam Fordyce, MLO (Gen. D. Jones's group); the relay is to be used as a supplement or replacement of ship and airborne ground stations and provide a communication link between a low earth orbit CSM and MSFN ground stations. Possibly three relays will be used, each placed 120 degrees around the earth in a stationary orbit. Transmission path would be from the ground to one of the relay satellites to the CSM and return over the same path. Several meetings with Mr. Fordyce have established some specific ground rules in the design: (a) System to operate on S-Band. (b) Directive antenna of CSM may be used for CSM to relay data link. (c) No modification of operational CSM communication equipment.

The original ground rules called for the LEM Relay to be manned for initial operation, also, that the relay electronics be located in a LEM, hence the name LEM Relay. The rules have since been relaxed to allow the use of any convenient carrier as long as it is a Saturn, with or without a man. At this time it appears that it would be best to put up all three or four relays with a single launch. It also appears that the complete communication system can be completely simulated on the ground, thus side stepping any requirement for launching an experiment; i.e., when the system is launched it will be operational. The \$145K will be used to prepare a program development plan to present before the Experiments Review Board in December this year.

\*Copies to DIR and R-DIR only.

W.H.

V or IB?

How heavy are these relays?

Why can't the JOD relay satellites be used? B

B 8/16

F-1

Test TW-048 was conducted at the West Area F-1 Test Stand with F-1 engine S/N 2010 on August 5, 1966. This engine will be refired and is planned to be installed on S-1C-T. F-1 engine S/N 4017 revealed no irregularities upon teardown and inspection of the gas generator system. Rocketdyne has recommended that the engine be re-orificed (increase GG fuel flowrate) and fired again. If the test is good (performance and no GG oscillations) then the engine will be installed on S-1C-502. P&VE and R-TEST-SP prefer engine re-test (additional instrumentation) with same orifices to establish a baseline for re-orificing and also, primarily, to determine the cause of the initial GG oscillation (FW-047). ✓

S-11 (MTF)

A meeting was held during the week ending August 5, 1966, to review S-11-1 acceptance specification and criteria. Facility interface checkouts, using GETS, were accomplished in preparation for S-11-1 arrival scheduled for August 16, 1966. ✓

GSE

Testing of flight umbilical on Arms 6 and 7 (S-IVB Aft and S-IVB Forward) was completed this past week. This completes testing for all 501 Arms except Tail Service Masts. ✓

Due to a shortage of KSC supplied spares, complete refurbishing of the swing arms cannot be accomplished. The 501 set of hardware will be delivered to the Cape with defective valves, regulators, pressure switches, etc. All of these components will be identified to KSC and will require replacement and service arm system test sometime during 501 checkouts. ✓

A complete assessment of the next set of arms to undergo testing will be made this week. KSC has not been able to provide the spares required and in many cases, hardware was removed from the 3rd set of equipment in order not to impact the testing of the 501 Arms. Lack of spare part support from KSC could have a serious impact on the schedule of the next set of hardware. ✓



NOTES 8-8-66 HOELZER

B 8/16

MSF ADP STUDY: Dr. Mueller has initiated a study of computer use and management in MSF. General Bogart held one meeting in February relative to this subject and is reviewing the progress. An extensive questionnaire is being prepared and will be issued to each MSF Center for completion within the next month. The general purpose is to answer questions raised in Congress and to define problem areas. ✓

B2/10

S-IVB PANEL FLUTTER: A potentially serious SA-204 problem has arisen. You may recall that in March a possible problem arose regarding panel flutter on the fore-and-aft skirts of the S-IVB. It was decided at that time to fund wind tunnel tests at AEDC to determine if the problem really existed. P&VE does not believe a problem exists nor does DAC; on the other hand, AERO believes that the probability of a flutter problem on the S-IVB Saturn IB is great enough to require a fix. It was agreed in March that we would prepare the kit for a fix but would not incorporate it unless wind tunnel tests determined that a change is necessary. Our problem is that the tests have slipped and will not begin until September 12, 1966. Because of this R&DO has recommended that the fix be incorporated immediately. Although the kit has been prepared, 1,000 to 2,000 manhours would be required to install it at KSC. If we make the change now, there will be some impact to the schedule. If we make the change later, the impact will no doubt be greater. I have taken the following position: We will not fly SA-204 without the structural modification if the data from the wind tunnel tests indicate that it is necessary. On the other hand, we will not make the modification at this time since the probability that we will not have to make the change at all seems to be reasonably high. This decision incorporates the fact that if the wind tunnel tests at such a late date indicate that the modification is required, there may be as much as a week's effect on the launch date. This is a chance I feel we will have to take. ✓

WATER-METHANOL MANIFOLDS FOR INSTRUMENT UNITS: Reference is made to Mr. Kuer's notes dated July 25 (copy attached). We have been working for sometime with ME, P&VE and QUAL to insure that an adequate long-term solution to the IU manifold problem is obtained. ME completed development of their new DC welding technique on July 22. Because of the airline strike, we were unable to get an MSFC/IBM team to Solar until July 27 to review the technique and its special equipment requirements with Solar. It appears that Solar already has the necessary equipment and will be able to adopt the new technique. IBM has directed Solar to manufacture three production samples for evaluation. These should be available shortly. If they are satisfactory, our plan is to implement the new technique as soon as we are sure all potential problems have been solved.

Perhaps more interesting is that an IBM study of the situation indicates that we may be able to eliminate the manifolds entirely by using one of the honeycomb channels in back of the cold plate in lieu of the manifold. We will keep you informed of this. ✓

(1 attachment described above)

NOTES 8-8-66 JOHNSON

B 8/16

Experiment S-027 Authorization to proceed with the University of Wisconsin X-Ray Astronomy experiment (Dr. Kraushaar) and funding authorization of \$750,000 have been received. Astrionics will be the lead laboratory on this project. Preliminary discussions on the contracted effort at Wisconsin are scheduled for this week. A target date of August 19 has been set for negotiation of a contract with Wisconsin. They will subcontract the production of the hardware. Flight on SA 210 as an I.U. passenger is planned. ✓

Workshop Experiments A firm selection has not yet been made of experiments to be provided by MSFC for the Workshop. Meetings with MSC, DOD, and headquarters personnel (Piland representing MSC) resulted in further analysis of possible experiment packages, but did not lead to a firm selection. Doug Lord has scheduled meetings of an OMSF Experiments Committee at MSC and MSFC to review candidate experiments. A copy of a letter announcing this plan is attached. ✓

Status of SRT/ART programs remains unchanged. ✓



B 8/16

1. S-IC-1: S-IC-1 had been scheduled to be returned to R-ME for "Prep for Shipment" on July 28. Owing to many unresolved difficulties and by agreement with IO and R-QUAL, the new schedule is:

R-QUAL to R-ME	August 10
Ship to KSC	August 27

The problems have been caused by (a) unsatisfactory engineering and/or disagreement with no resolution between R-QUAL and Boeing Design, (b) shortage and/or repeated failure of a few critical components, and (c) commitment of ECP's whereby the work is to be performed after checkout.

There are approximately 200 hours of stage work outstanding now, 600 hours to perform "Prep for Shipment" (includes 3 ECP's), and approximately 4000 hours of scheduled travel work and 7 ECP's to be done at KSC.

A barge arrived on July 20 to ship the major bulk items to KSC; e.g., engine skirts and engine insulation, etc.; packaging and barge loading has been completed. Barge was scheduled to leave here August 6. ✓

2. S-IC-2: S-IC-2 was scheduled to transfer to R-QUAL when final checkout on S-IC-1 was completed. Approximately 1700 man-hours remain to be performed on this stage before transfer to R-QUAL (1100 of these are on engine insulation which does not affect checkout); there are 75 man-hours of work to be done at R-QUAL and 120 man-hours during "Prep for Shipment" due to ECP commitments and about the same amount of travel work to KSC as is required for S-IC-1.

The major technical problem on S-IC-2 is the questionable outboard engine, 4017. This engine was removed from the stage after static, was hot fired on July 25 and found to still be out of specification. The engine has been returned to R-ME for disassembly and investigation. After rework, it must be hot fired again. S-IC-2 will be delivered to R-QUAL without this engine. ✓

3. Since S-IC-1 was delivered to R-QUAL for checkout on September 27, 1965, R-ME has received 9808 EAPL's and 8102 EO's against that stage. S-IC-2 was delivered to R-QUAL for checkout on January 17, 1966; R-ME has received 4853 EAPL's and 3658 EO's against this stage.

Since S-IC-1 was delivered to R-QUAL on September 27, 1965, 17,781 EO's and 15,037 EAPL's have been issued against S-IC-S, -T, -1, and -2. A total of 748 ECP's, CAM's, or PRR's has been issued to date and there are even more at this date that are pending but have not yet been approved by the Change Board. ✓

B 8/16

1. LH<sub>2</sub> EXPERIMENT REVIEW WITH LEWIS RESEARCH CENTER (LeRC) AND OTHERS - On August 3, an all-day review of AS-203 LH<sub>2</sub> Experiment flight results was held wherein representatives of LeRC, General-Dynamics/Convair, and Manned Spacecraft Center were briefed by personnel of Chrysler, DAC, and MSFC. Approximately 35 persons attended, several of whom were from LeRC Centaur Office. It is hoped that this interchange will be helpful to Centaur. ✓

2. AS-203 LH<sub>2</sub> EXPERIMENT QUALITY METER - It has not been possible to establish that the vent gas quality meter did not work. During almost the entire flight, superheated hydrogen gas was vented. The quality meter was not designed for this condition and has an essentially random output for this condition. During the short periods when temperatures near saturation were measured (rapid LH<sub>2</sub> tank blowdown) in the vent, the meter read approximately 20% vapor, 80% liquid (by mass). This reading may have been valid. A conclusion that the meter did or did not operate properly requires further data analysis. The success of the continuous venting propellant settling scheme, demonstrated by AS-203, obviates the requirement for flying a quality meter on S-IVB/V LOR missions. However, the quality meter is attractive enough to warrant further development. ✓

3. EXPERIMENT RACK - Design loads for the MSFC RACK structure have been frozen, and final design drawings are being prepared. These loads reflect the anticipated use of the RACK for the ATM, Project "Thermo", and Electromagnetic Radiation Detection experiment: ✓

4. STRUCTURAL QUALIFICATION FOR S-IC - Structural qualification of the S-IC oxidizer tank and forward skirt was completed July 29. This completes man-rating (safety factor of 1.4 on design loads) of all major structural components of the S-IC stage, SA-501 -503 configuration. ✓

5. PRESSURE-FED STAGE - Work has been initiated to define the design parameters for a nominal 250 K-pound-thrust storable-propellant pressure-fed stage for use in various possible applications: strap-on booster, interplanetary injection stage and/or interplanetary braking stage. It is intended that commonality of subsystems for the various applications will allow the development of a basic stage to which "kits" may be added for the specific requirements of various missions.

6. VOYAGER SHROUD STUDY - A conceptual design study of a shroud to house the two planetary vehicles proposed for the Saturn V Voyager mission has been started. ✓

7. S-IC-F THRUST STRUCTURE BOLT CORROSION - It was reported at the S-IC Quarterly Review that corrosion had been observed on some S-IC-F thrust structure bolts. It develops that the bolts are on the stage handling fixture and, by design, are to be used only once, regardless of condition; thus, there is no problem with these particular bolts. Independent of the reported corrosion problem, TBC will use a different type bolt after the particular bolts in the S-IC-F handling fixture are discarded. ✓

W.L.  
Request  
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on layout  
and possible  
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B 8/16

1. POP 66-3 - A TWX has been received from MSF advising us of the areas of interest for the POP 66-3 Review. Cost, obligation, and manpower requirements for FY 67 and FY 68 are to be furnished as a firm position. Details of all other requirements for both AO and R&D - including support contractors - are required. The same review group will attend the Apollo, AAP, and AO discussions to attain a better appreciation of interfaces between the appropriations and programs. They have requested we show them by program the total AO and R&D support that is required.

The POP Review was held with Mr. Rees August 13 presenting the Apollo, AO, and C of F portions. The SAAP Review is scheduled to be held August 8 from 3:00 p.m. to 5:00 p.m. in the Eighth Floor Conference Room. We have forwarded the reviewed portions (AO and C of F) of the total POP to MSF and will send the remainder after the final review. ✓

2. QUARTERLY MEETING OF THE INTER-SERVICE COMMITTEE ON TECHNICAL FACILITIES - On August 15 and 16, MSFC is host for the quarterly meeting of the Inter-Service Committee on Technical Facilities (ISCTF). We expect about twenty representatives from government agencies in the Southeastern United States to attend.

A presentation on the MSFC Technology Utilization Program is scheduled, and briefings and tours of technical facilities are planned at the Research Projects Laboratory, the Manufacturing Engineering Laboratory and the Astrionics Laboratory. We will emphasize in our briefings the development and testing capabilities at MSFC which could be of potential use to other agencies and areas in which MSFC might desire assistance or cross fertilization in the future. ✓

3. VISIT OF HOUSE SPACE COMMITTEE STAFF MEMBER, Mr. GOULD - Due to the airlines strike, Mr. Gould will visit MTF and Michoud on August 17 and 18 in lieu of August 10 and 11 as was originally planned. We have received additional guidance for this appraisal of plant operations and ADP. ✓

4. CONGRESSIONAL STAFF STUDY OF APOLLO PROGRESS - Despite the airlines strike, Mr. Wilson has managed to stay on schedule on his assessment of the Apollo program. The next scheduled event is the visit to Douglas on August 11. Col. Hall will represent MSFC at this meeting. Transcripts of the MSF proceedings have been distributed to Gen. O'Connor, Sat IB and Sat V. ✓



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Panel Activities : General Phillips has requested that each panel present to the Panel Review Board (August 22) their future plans. Each panel is to review its scope statements with proposed scope changes, responsibilities, subpanel operations, memberships, etc., for FY-67 and beyond. A premeeting is being held for Mr. Rees on this and other PRB matters on August 16, 1966. ✓

Saturn "Soft Spot" Areas: In the initial effort to list and organize the "soft spot" areas of our Saturn programs, we have developed with the laboratories a list of over 200 items that may be in this category. We will filter out priority items and essential internal activities to define the required steps to be taken next. The intent is to do as much as can be done on these items in R&D Operations, within our resources. ✓ The cases requiring action outside R&D Operations will be individually documented (and coordinated with the affected organizations) for final management decisions. ✓

B 8/16

1. Accessibility of Saturn V Secure Range Safety Command System - (Ref your note of 16 July 66, attachment #1) - The S-II Stage Secure Range Command System Decoders are being relocated for easy access, effective with AS-504. Effectivity on AS-503 would have resulted in a schedule impact. ✓

2. SA-501 Launch Operations Plans and Catalog of Tests - Scott Fellows indicated (Ref Notes 8/1/66 Fellows, attachment #2) that subject documents are not acceptable to R&DO as written and a meeting had been arranged with KSC by R&DO to discuss changes to make documents acceptable. The meeting was cancelled at my request, since a MSFC position had not been established. The basic question is the degree and method of controlling and policing KSC. The scheme of documentation, of which subject documents are only a part, has been established in the MSFC/KSC Sub-agreement for Prelaunch Checkout and Launch Operations. I think we can essentially fulfill the R&DO requirements within the established Sub-agreement; however, this may involve a different method than being proposed by R&DO. I will follow this problem to its satisfactory completion. ✓

3. MSFC/KSC Automation Development Plan - A briefing on the Automation Development Plan was presented to Dr. Rees, General O'Connor, Mr. Cook (R-DIR), myself, and to other MSFC personnel on Wednesday, 3 August 66. This plan will be distributed on Monday, 8 August 66. It contains a Foreword, signed by Dr. Rees (for you) and by Dr. Debus. These signatures of endorsement should serve to put proper emphasis into the implementation of the plan. ✓

4. S-IC-1 Stage - (Ref Notes 8/1/66 Rudolph, item 1, attachment #3)

- Post captive checkout completion expected on Wednesday, 10 August 66, (2 weeks behind schedule). ✓
- Stage will depart MSFC for KSC on Saturday, 27 August 66 and arrive "on dock" KSC on Wednesday, 7 September 66 (9 days behind schedule). ✓
- Delayed arrival will support KSC erection schedule without impact. ✓
- TWX sent to General Phillips requesting approval in change to S-IC-1 Stage "on dock" at KSC date. ✓

3 Attachments: a/s (DIR, I-DIR & R-DIR's copy only)

NOTES 8/8/66 SPEER

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8/16

1. AS-202 LAUNCH PREPARATIONS: The AS-202 Countdown Demonstration Test (CDDT) was originally scheduled to arrive at a T-0 of 1020 CST on 8/4. Due to continuing S/C fuel cell leak problems, T-0 was rescheduled six times such that T-0 was to finally occur 2300 CST on 8/6. However, the count for this T-0 launch got to T-10 hours, 30 minutes and held approximately 6 hours due to S/C ACE link problems, at which time a scrub was called and the CDDT T-0 time was rescheduled to 2300 CST 8/7. T-0 was finally reached at 1:33 am on 8/8; no holds were caused by the launch vehicle. ✓

2. AS-202 LAUNCH SUPPORT: The Eastern Test Range will support the AS-202 common bulkhead test (rupture expected some 200 to 600 sec. after S-IVB cutoff) with aircraft rather than a ship, as originally requested by MSFC. Two aircraft will provide a total of six hours coverage on station (one at a time). ✓

3. GROUND WIND LAUNCH RESTRICTIONS: At the request of P&VE and Shea (through I-IB) we are attempting to monitor in the HOSC the bending moment induced in the AS-202 vehicle by ground winds during the pre-launch countdown. The bending moment calculation, based on the eight S-IB LOX stud strain gages, will be tried as a technical experiment at the HOSC on AS-202. By monitoring bending moment directly rather than calculating a wind speed limit corresponding to a bending load structural limit it is hoped we may gain an increase in launch probability. ✓

4. MISSION STATUS REPORT: As a result of a request by Dr. Rees we are including all Laboratories and Mr. Richard's office in distribution of these short and interesting daily reports from the Mission Director. ✓

5. AS-203 DEBRIS: According to Captain Holcomb (OMSF) two large skin portions (10 X 12 feet or larger) have been tentatively identified to have come from the S-IVB/203. One was found in South America, the other in Mozambique. Recovery appears to be difficult due to local terrain; however, it is reported that the paint lettering is still visible. ✓

6. OPERATIONS MANAGEMENT MEETING: This meeting was held on 8/12 at PAFB, Florida. Gen. Davis and Mr. Christensen co-chaired. NASA's strongest interface with DOD are the Apollo ships and aircraft. Their testing schedules are getting in conflict with NASA requirements for early use. On another item Porter Brown (OSRO) presented his plans to identify all documents which are presently used in addition to the main requirements documents (PSRD) in an effort to unload some of the supporting documentation from the unwieldy PSRD. ✓



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NOTES 8-8-66 Stuhlinger

1. EMR SATELLITE: Dr. Nancy Roman, after reading in the Space Daily that we have let a contract for a dual UV camera with the University of Arizona (Dr. Tifft), was quite upset by the fear that MSFC may initiate an astronomy project without adhering to the formal approval route through her sub-committee and OSSA. In a number of telephone discussions with her, Henry Smith, Dick Allenby, and Jim Elms, we succeeded in removing this fear. Ed Cortright assured Allenby that he will support us in this project. We should, however, give a presentation to OSSA on the EMR proposal, and on all other projects which we are presently carrying out for OSSA (ATM, the Kraushaar experiment, the Orbiting Astronomical Support Facility, and others) at the earliest mutually agreeable date, possibly on September 14. ✓

Copy of a note to Jim Shepherd is attached as a source of information in case you should discuss the matter with Ed Cortright. However, no action on your part is presently required. ✓

2. PEGASUS RENDEZVOUS: The experiments for the Pegasus rendezvous and coupon recovery have a good chance to become the prime mission on Flight 210. ✓ RPL's role will be that of experimenters for surface radiometric property measurements, including the solar reflectometer and meteoroid coupon analysis.

3. LUNAR EXPLORATION STUDIES: On August 4, ASO and RPL gave a two-day presentation to Phil Culbertson (OMSF) on Lunar Experiment Program Planning in preparation of the JAG meeting later in August. Culbertson was well pleased with our work and expressed the hope that we will continue to support him with such studies in spite of the fact that lunar exploration has been indicated by Dr. Seamans as one of the missions to be assigned to MSC. We will be glad to continue our support until the JAG meeting; ✓ after this date, we expect to reduce our support as a consequence of the mission assignment to MSC. ✓

4. NEW PHD IN RPL: George Bucher, a member of MSFC since 1956, was awarded a Ph.D degree in Industrial Engineering and Management for a thesis on research documentation systems in government agencies by Oklahoma State University last week. ✓

B 8/16

1. Manned Fly-By Studies: A series of contracted studies of manned Mars/Venus fly-by missions have been initiated; contractor orientation meetings were held at MSFC on August 3 and 4, 1966.

The objective of the study package is to investigate over-all requirements for manned Mars/Venus fly-by missions, and to provide sufficient information for NASA management decision to enter a project definition phase. The study package includes:

- a. Missions and Systems Study - NAA/S&ID - \$400 K.
- b. Study of S-IVB Adaptation for use as injection stage - Douglas - \$100 K.
- c. Study of S-II Adaptation for use as injection stage - NAA/S&ID - \$100 K.

These studies will complement the MSF "Planetary JAG" exercise, conducted during the summer, and provide in-depth analysis of problem areas identified.

This work is funded by Ed Gray, and will be one of our major study efforts during the next year. The studies are being managed for MSFC by R. Harris, R-AS-VP; B. Noblitt, R-AERO-X; W. Wales and L. Allen, R-P&VE-A, with support from my office and the laboratories. ✓

August 15, 1966



B 8/15

F-1

Test FW-049 was conducted on the West Area F-1 Test Stand with F-1 engine S/N F-2010 on August 9, 1966, for a mainstage duration of 37 seconds. Test FW-050, scheduled for August 10, 1966, was cancelled due to a GG ball valve lox leak. Engine S/N F-2010 will be removed and prepared for installation on S-1C-T so that F-1 Engine S/N 4017 (S-1C-2) may be reorificed as recommended by Rocketdyne and refired at the beginning of next week. ✓

S-IVB STAGE (SACTO)

S-IVB-206 The acceptance firing of S-IVB-206 has been rescheduled for Thursday, August 18, 1966. No further constraints to the schedule are expected. ✓

S-IVB-501 The shipment of S-IVB-501 to KSC via the Super Guppy was made on Friday, August 12, 1966. At the time of shipment, there were approximately 415 hours of work outstanding on the vehicle. ✓

S-11 STAGE (MTF)

A series of meetings have culminated in a redline list for S-11-1. ✓

S-1B STAGE

S-1B-7 The stage arrived on the Barge Poseidon in the morning of August 11, 1966, and was installed in the test tower on the same day. The short duration test is scheduled for September 1, 1966. ✓

S-IVB (MSFC)

Test S-IVB-032 was conducted at the S-IVB Test Stand, using J-2 engine J-2048, on August 11, 1966, for a duration of 31 seconds. The primary test objectives were to simulate the S-IVB-202 propellant tank pressurization schedule, to gimbal with the S-IVB hydraulic system, to test a new upstream half of the Augmented Spark Igniter (ASI) lox line, and to test the new propellant depletion cutoff system. The test was terminated by an observer due to a fire in the engine area. Leak tests revealed a crack in the downstream half of the ASI lox line, immediately downstream of the ASI lox manifold.

A fuel leak was also noted at a capped instrumentation port seal on the ASI fuel manifold. Disassembly and inspection revealed that a copper-coated "hot-gas" seal was installed rather than a teflon-coated cryogenic seal as specified on the assembly drawing. However, the engine illustrated parts breakdown documentation erroneously shows the use of a "hot-gas" seal. Rocketdyne has been informed of this documentation error which should be corrected. Furthermore, these seals should be inspected on all J-2 engines in the field. ✓

GSE

Concerning your comment on 7/18/66 Notes, (copy attached for Dr. von Braun and Mr. Weidner) the LES Tower Simulator that failed during tracking tests of the Saturn V Environmental Chamber, did not structurally simulate the flight article. Simulation was configuration only. Failure and data were reported to both KSC and MSC for flight system evaluation. ✓

8/15

B 8/15

1. IBM 7094 COMPUTER UTILIZATION FOR JULY 1966: Total billable time during July 1966 for the two IBM 7094 computers was 1287 hours. This is the highest billable time in the last ten months and represents a 34 per cent increase over the lowest month of this period. The per cent effectiveness of these two computers reached an all-time high during July 1966 of 96.2 per cent. We cannot expect to maintain this high level efficiency over the next few months because the effect of changing support contractors is beginning to be felt. Computer Sciences Corporation has retained about 50% of the General Electric work force, hence about one-half of our new group must be trained in our work here at MSFC. Even after this training period, we hope our customers understand that they must expect a lower volume level of performance from us in the future since our new support contractor has a lower manpower ceiling than we have had in the past. ✓

2. NASA HEADQUARTERS REQUIREMENT FOR COMPUTATION LABORATORY SUPPORT:

a. A request for support, manpower, and machine time was received from Mr. D. A. Linn, Director, Procurement Management, NASA Headquarters. This support is to check out a Multiple Incentive Contract Analysis Computer Model (MICA-Mod II) developed by Boeing Company's aerospace group in Seattle under contract to NASA Headquarters. ✓

b. Computation Laboratory proposes to furnish the requested support provided that travel funds be made available as the Laboratory does not have sufficient funds to cover this trip and other required travel. ✓

NOTES 8/15/66 JAMES

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QTS 8/15

MISSION DEFINITION DOCUMENT: We continue to be late in delivering the Mission Definition Document for each flight to the Instrument Unit contractor. Further, when it is delivered it is usually only partially complete and the data is tentative and is often changed prior to flight. This imposes a serious burden on IBM in developing the flight program. For example, the Mission Definition Document for SA-207 which was due to be delivered in May was only recently delivered to IBM. The document contains about 50% of the data for SA-207 and about 33% of the data for SA-208. Much of this data will be changed prior to flight time. IBM's current estimate is that they will not be able to deliver flight programs for these vehicles prior to June 1967. The programs should be available in May 1967. There are many reasons for our late and tentative deliveries. On SA-207 and SA-208 much negotiation was required before we finally arrived at a rendezvous scheme agreeable to both MSC and MSFC. In addition, there are many other items such as the results of static test firings which are necessary before the final trajectory can be paced. All of these items impact firm deliveries. I will have my Systems Engineering office set up a meeting with all concerned in the near future to determine if any improvement can be made. ✓

FILTERS FOR FLIGHT CONTROL COMPUTER: The input filter for the flight control computer is refined for each flight mission. Although we recently adopted a standardized design which facilitates making necessary changes, it will lack the flexibility to satisfy the wide variety of missions expected from the AAP. Because of this, R-ASTR is now investigating the feasibility of adopting "adaptive" filters now in widespread use in industry. We are following their investigation with interest. ✓

AS-202: The launch date of AS-202 has been rescheduled to 25 August. The firmness of this date will depend on the outcome of the Flight Readiness Test which is scheduled to begin this morning, 15 August. ✓



NOTES 8/15/66 JOHNSON

B 8/15

ART/SRT and Supporting Development Program A review of the status of FY 66 Program and the FY 67 Program as of August 10, is given below:

<u>FY 66</u>	<u>ANNUAL PLAN</u>	<u>PROGRAM AUTHORITY</u>	<u>PROCESSED TO FMO</u>	<u>OBLIGATED</u>
OART	18,990,000	18,990,000	18,109,331	14,174,695
MSF	9,450,000	9,450,000	9,448,734	9,219,070
OSSA	1,138,000	923,000	890,590	727,076
OTDA	1,627,000	1,627,000	1,626,142	1,458,257
TOTALS	31,205,000	30,990,000	30,074,797	25,579,098

<u>FY 67</u>	<u>ANNUAL PLAN</u>	<u>PROGRAM AUTHORITY</u>	<u>PROCESSED TO FMO</u>	<u>OBLIGATED</u>
OART	9,830,000	1,370,000	400,000	0
MSF	6,000,000	0	360,000	0
OSSA	1,570,000	125,000	0	0
OTDA	900,000	200,000	99,000	0
TOTALS	18,300,000	1,695,000	859,000	0

Unobligated residuals remaining in the FY 66 Program are largely due to receipt of authority subsequent to the normal close of the fiscal year. All of the paper necessary to complete obligation of these funds is now in process and it is anticipated that obligation will be largely completed prior to the close of this quarter. The 1966 OSSA annual plan is being reviewed to determine the probability of receipt of additional SRT funding in the launch vehicle development area. My estimate is additional funds from this source are quite improbable; however, conversations are continuing with headquarters. The amount in question is slightly more than \$200,000.

Referring to FY 67 Program, the obligation plan is not yet completely firm; however, it will probably be based on an approximate 120 day span between receipt of authority and completion of obligation. ✓

Workshop Experiments This office has agreed with Mr. Ferguson to execute a very thorough review of all experiments now in progress at MSFC with the view of devising a somewhat more select group of experiments than has been previously discussed for the Workshop. The purpose of this review will be an attempt to impose upon the total experiment package the criteria that the experiment either add to our knowledge in the area of habitability in space or that it provide specific design criteria for future such space vehicles. We will engage in conversations with both MSC and the Air Force and will be reviewing quite carefully the biomedical measurements program being pulled together by these two groups and Headquarters to support the Workshop experiment. I am somewhatly concerned that full weight has not yet been given by our experiment planners to this type of measurement. ✓

Doug Lord, together with personnel from Headquarters and MSC, is scheduled to review the entire experiment package Monday, Tuesday, and Wednesday of this week. ✓

NOTES 8-15-66, KUERS

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Electro-Magnetic Radiation (EMR) Experiment Package: The mock-up of this package on a LEM-Rack is complete and ready for your inspection in Building 4755. The mock-up consists of a LEM ascent stage, a LEM rack replacing the descent stage, gamma-ray sensors, X-ray sensors, and UV camera models. ✓

B 8/15

1. J-2 ENGINE - To date, 17 engine tests of the 30 test qualification program have been successfully completed for 2284 seconds of the required 3750 seconds. Of the 2284 seconds, 1188 have been conducted at a maximum engine mixture ratio. There have been no problems that will affect qualification. ✓

2. PRESENTATION OF MSFC LASER DOPPLER VELOCIMETER - The P&VE-sponsored program for the presentation and demonstration of the BECO-MSFC Laser Doppler Velocimeter was held August 9, 1966, in the P&VE Complex. Of the forty-five attendees, 12 represented private industry, 9 represented universities, and 23 represented governmental agencies. ✓

3. REAL TIME UPDATED SATURN I BENDING MOMENT - A real time Updated Saturn I vehicle bending moment display at MSFC has been requested in support of the MSC command module tension tie problem. The bending moment will be displayed during prelaunch for vehicles AS-202 through AS-212. The display system has been implemented at Computation Laboratory and is being checked out. ✓

4. EXPLOSIVE JOINING OF LIGHT ALLOYS - Our Materials Division, in conjunction with ME, has been successful in making laminated sheets of aluminum-aluminum and aluminum-titanium by an explosive joining technique. This program which is to be extended to tri-laminates and to the use of aluminum, titanium, magnesium, and beryllium materials is most intriguing since one might envision the use of aluminum clad titanium as oxidizer tankage as but one of many possibilities. ✓

5. PROJECT THERMO - The Phase B study contracts for experiment definition, instrumentation definition, and LEM integration have finally been signed. A very closely coordinated in-house effort to supplement these contracts and complete the definition phase is now being generated. A kick-off meeting for contractors and in-house personnel is to be held August 18, 1966. The Phase B effort is approximately of a 6-month duration and more than one million dollars will have been spent on this project by then. We believe that the time to pursue an official mission assignment through the S/AAP channels is getting close. Tentatively, through the very cooperative efforts of Dr. Werner from Doug Lord's Experiment Office, AS-510 is being earmarked, but there are other contenders for these flights. We are ready to give you and other Center Management personnel a briefing on this payload project, which originally consisted of single experiments 3, 4, 5, 6, and 7.

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1. POP 66-3 - A team of 16 MSF personnel reviewed Marshall's POP 66-3 on August 10 and 11. For the first time, a consolidated review of the AO and R&D POP's was conducted. ✓  
Members of the MSF team included Mr. Bill Lilly, Mr. Paul Cotton, and Col. Roy Seccomb. ✓

As a result of the review and comments made by Mr. Lilly, a reprogramming of \$10M from Saturn V to Saturn IB will be accomplished prior to official submission of MSFC budget.

NOTES 8/22/66 BELEW

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8/22 983

PAYLOAD INTEGRATION: Second monthly meetings with Lockheed and Martin are now scheduled to be held at MSFC on September 7 and 9 respectively. ✓

MSFC portion of the study to compare Augmented LM and Shelter/Taxi is being completed this week. Prime action on this task is with Advanced Systems (Madewell) and this office. Input to Headquarters is scheduled for next week. Lockheed was given a quick-look task to compare payload integration aspects of the missions. Their results were unfavorable to the Augmented LM. One indication was that it would take 7 ALM launches to accomplish the total experiment package versus 4 S/T launches. ✓

ATM: Prepared for the Dr. Mueller presentation on August 19 a more detailed breakout of costs for the ATM. The briefing was well received by Dr. Mueller with the exception that he would like more effort carried by MSFC in-house. After the formal presentation, Dr. Mueller showed his concept for an ATM/LM tethered to a workshop. He requested that MSFC look at this approach in the coming weeks and put the docked mode and gimbal mount on a lesser priority. ✓

The Principal Investigators at Goddard, AS&E and NRL were visited this week to discuss schedules, cost and general operations. In every case, there are problems with schedule and cost to meet the '68 flight. The remaining two Principal Investigators will be visited during the next two weeks, but from preliminary data, it appears that there are also schedule and cost problems. ✓

EDPs on all five experiments have been drafted and are now being finalized. ✓

S-027: Present indications are that a contract with the University of Wisconsin cannot be finalized until about September 15 to October 1. ✓

S-IVB AIRLOCK CONTRACT: On Friday, August 19 Headquarters authorized MSC to enter into final contract negotiations with the McDonnell Aircraft Corp. to procure one flight type S-IVB airlock, associated test programs and hardware, and an option for follow-on S-IVB airlocks. This would be a fixed price contract with fixed price options. ✓

POTENTIAL AS-210/211 MISSION: Dr. Mueller proposed that AS-210 and 211 be flown together as a link-up mission. The ATM would be semi rigidly attached to the AS-211 orbital workshop. MSFC agreed to study the configuration. ✓

B 8/25

J-2 ENGINE Repairs to the interstage water cooler in the Rocket Test Facility (RTF) pumping system at AEDC are complete. The test attempt of 8-6-66 was the first attempt by AEDC to operate the RTF pumping system and the Propulsion Wind Tunnel system is parallel. Balance between the two exhaust systems is extremely critical. An "air-on" period is planned for Monday, August 22 to prove systems will work together. If this test is successful, an engine test is planned for August 25 or 26. ✓

With the exception of new design, new technology, and information concerning malfunctions ascribed to engine design, the J-2 Engine has been declassified effective August 16, 1966. ✓

A J-2 R&D engine test at Rocketdyne was cut off during a stability investigation program by the vibration safety cutoff (VSC) device. The 50 grain bomb installed in the combustion zone malfunctioned causing 51 holes in the thrust chamber tubes up to 3/16 x 1/2 inch in size. It is postulated that the detonation of the bomb induced engine instability and the thrust chamber damage prevented damping. There was no damage to the engine other than the thrust chamber tubes. ✓

The static firing for the S-IVB Stage, SA 206 was completed August 19, 1966. The duration of the engine firing was 434 seconds mainstage. ✓

H-1 ENGINE Performance shifts have been noted on seven production engines at Neosho. These are in-run shifts and are within the model specs. They are characterized by a decay of approximately 1.5K in thrust and an increase of approximately 0.023 in mixture ratio. An R&D program is in progress to determine the cause of the thrust shift, using one of the production engines (H-7084) that exhibited this anomaly. Eighteen tests have been conducted on H-7084, at Canoga Park and Neosho, without reproducing a thrust shift. Special instrumentation on production engines indicates a change in flow resistance in the thrust chamber. Water flow tests of the thrust chamber on H-7084 will be conducted next week. As the thrust shifts are small, engine performance remains within model specification requirements. No impact on flight vehicles is indicated.

A general performance degradation on all eight engines was observed on test SA-37 on the S-IB-6 stage when compared to the SA-36 test data. This was not a performance shift as described in the above paragraphs, but rather an apparent overall run decrease in thrust from the first test. There is some question as to the instrumentation accuracy and whether some LOX dilution might have occurred. To provide assurance that engine control system damage or contamination did not occur, the gas generator and turbine were removed from one stage engine and inspected. Condition of the component was satisfactory. It is the MSFC position that S-IB-6 is ready to fly. ✓

C-1 ENGINE The operating characteristics and durability engine testing was continued. As of August 10, 1966, a total of 1988 engine tests have been conducted accumulating 56,296 seconds of hot firing time with 119,028 engine starts. An additional SIVB quadredundant valve engine has accumulated 1,689 seconds of hot firing time with 1,378 engine starts. ✓

Nozzle-up basic engine ignition testing in large system test cell (R4, 1-2) was continued. To date, a total of 1,140 starts and 1,447 starts with 60°F and 40°F propellant inlet temperatures respectively, have been completed under a variety of operating fire fraction and 100,000 feet altitude with no indication of excessive ignition or manifold spikes. Tests to evaluate other duty cycles and lower propellant inlet temperature (20°F are continuing). ✓

F-1 ENGINE The Procurement Plan for 70 F-1 engines and Production Support for the AAP was transmitted to NASA Headquarters for approval on 8-17-66.

A meeting was held between personnel from R-P&VE, I-E-F, I-V-SIC, The Boeing Company and Rocketdyne to discuss the fatigue failure of high pressure fuel duct boss on R&D engine 033. It was determined that the failure was caused by vibrational stresses imposed by the relatively rigid Boeing actuator hydraulic supply line. The Boeing Company has an action item to reduce the forces to an acceptable level. ✓



NOTES - 8/22/66 - CONSTAN

8/22/66

B 8/25

Visit of Colonel Gould to Michoud Assembly Facility

Colonel Gould, Technical Staff Member, House Staff Member, House Science and Astronautics Committee and others were briefed Thursday relative to alterations and construction, custodial services, security, and automatic data processing. Col. Gould appeared well satisfied with the presentation. ✓

NOTES 8/22/66 FELLOWS

8/22 958

B 8/25

1. S-IC-1 Data Package for KSC: Technical data required by KSC for the S-IC-1 is being assembled by my S-IC Stage Coordinator from laboratory information into a data package which can accompany the stage being shipped to the Cape about August 27. The few data elements which will not be available until September 2 will be shipped to KSC at that time without any adverse impact on planned Cape operations. ✓
2. Lead Laboratory Assignments: There are six special tasks currently assigned as Lead Laboratory responsibilities:

<u>Task</u>	<u>Laboratory</u>	<u>Engineering Manager</u>
Saturn IB/206, 208, and 210 Nose Cone and Shroud	P&VE	W. A. Brooksbank
Rack (Payload Module)	P&VE	W. A. Brooksbank
Saturn V Damper System	P&VE	W. A. Brooksbank
Apollo Telescope Mount	ASTR	W. P. Horton
Nuclear Ground Test Module	P&VE	*W. A. Brooksbank (Program Manager)
Orbital Workshop	P&VE	H. Palaoro

\*There is no IO Program Manager for this assignment.

The lead laboratories are charged with the full R&D Operations responsibility for their assigned tasks, supported by other laboratories as required. Several Research and Development Plans (RDP) for these tasks have already been prepared under lead laboratory management and two of the RDP's (for the Rack and Nose Cone) have been furnished to IO. For the Apollo Telescope Mount, one of the largest current special assignments, a Preliminary Project Development Plan was issued July 25, 1966. Staff coordination for these tasks is being done by members of my office in the same manner as for the Saturn Program. ✓

NOTES 8/22/66 GEISSLER

1. NASA Manned Space Station: In Dr. Seamans' letter of July 19, in which MSFC's participation in a preliminary study of a Manned Space Station was requested, the subject of meteorology was mentioned. Accordingly, we have made contact with Mr. Barker, (R-AS), and Mr. Stroud, GSFC, regarding our participation. Mr. Stroud chairs a panel which will establish requirements, constraints, advantages, and disadvantages of a space station for meteorological research and operations. We are preparing our thoughts on this subject, and will forward them to the panel. It is hoped that Mr. Scoggins, our Aerospace Environment Division, will be able to serve on the panel. MSFC participation on the various requirement study panels appears weak. Study results will be reported to Dr. Seamans by the panel on September 19. ✓

2. Sub-Panels of Flight Mechanics Panel: Significant items from the Aug 10, '66, Guidance and Performance Sub-Panel were: (a) AS-204 Venting Timeline: 204 Orbital Timeline showed programmed LOX and LH<sub>2</sub> vents and their proximity to ground stations. Determination of necessity, for relocation of vents over ground stations, will be made to see what ground action can be taken to prevent stage blow-up, should LOX vent valve fail to close; (b) AS-503 Variable Azimuth: Procedures for implementing the variable azimuth in the ground and flight systems will be defined; (c) Orbital and Translunar Sequence of Events for AS 207/208 and AS 503 will be integrated with orbital venting requirements, and will be published as a final sequence of events; (d) Mission Planning Status: Planning for AS-205 is still unsettled due to potential changes under consideration such as early separation of CSM followed by rendezvous with launch vehicle.

Significant items from Aug 11, '66, Reference Trajectory Sub-Panel were: (a) Discrete vs continuous launch opportunities: MSC proposed using only 10 discrete launch azimuths, instead of current continuous launch opportunity capability. Requirements for discrete launch azimuths will be defined, and impact on launch probability will be determined; (b) Operational Trajectory Procedures: Streamlined procedures for preparing operational trajectories are being investigated, so that both centers can produce a new trajectory in time for a subsequent monthly launch window, should a vehicle launch schedule slip occur; (c) Quick Turn-Around Targeting: - To provide flexibility and quick response in retargeting to meet changing mission requirements, the targeting process (determination of guidance presettings) must be streamlined. This need was emphasized by General Phillip's letter of June 4, '66, proposing changes to the Apollo Program Specification. Necessity for retargeting can be caused by changes in landing site, change to non-free return trajectory, and necessity for ability to land at one of several alternate landing sites. Present targeting is done several months before launch and requires a large computational effort. Improved computer methods, which will decrease the time and effort required, are being investigated. ✓



8/22 FS

B8/26

1. S-IC-501 STAGE: Prior to transfer to Manufacturing Engineering Laboratory weighing of the stage was completed. The total gross weight, including the forward handling ring and miscellaneous personnel platforms, was 324,891 pounds. This is the first time a three point compression weighing system, utilizing a self-calibrating, automatic digital force indicator, has been utilized to obtain the weight and longitudinal center of gravity on a stage at MSFC. Experience with this system in weighing the S-IC stage weight simulator and the S-IC-501 stage has shown this system to be very accurate and efficient. ✓
2. S-IC-502 STAGE: Mechanical checkout of the stage has started after calibration of the mechanical checkout equipment.

Engine 4017 has been released to R-TEST for a hot firing test. Replacement on the stage is expected this week.

The end-to-end resistance test (DC Bonding Measurement) for MIL-B-5087 was performed with satisfactory results. The bus-to-ground impedance test and the bus isolation test were performed with no discrepancies found. ✓

NOTES 8/22/66 HAEUSSERMANN

8/22 JFS

B 8/26

1. IU-500FS BATTERY FAILURE: (Reference Notes 8/8, 8/1, and 7/18). Messrs Stroud and Graff made a hurried trip to the Eagle-Picher Company in Joplin, Missouri to investigate the recent failures of the IU batteries. Examination of the failed batteries and tests revealed that the failures were caused by a combination of the following:

a. Vent valves on the cells of the batteries did not open at a low enough pressure (less than 10 psi).

b. The cells that failed did not have sufficient support to withstand an excessive internal pressure (more than 10 psi) due to a poor potting job.

As a result of these defects, the internal cell pressure after activation was sufficient to crack the cell case and allow electrolyte to seep out and come in contact with the battery case.

To prevent any future failures from occurring, the following steps have been taken:

a. 100% screening of vent valves at plant to obtain valves which open at 6 psi of pressure. ✓

b. Elimination of filler sheets between cells and between cells and battery case to assure proper flow of potting material around cells.

c. All cells of the battery will be pressure checked at 15 psi to assure adequate cell strength.

d. 100% inspection of a and b by the resident Government inspector. ✓

Additionally, all batteries at the Cape will have:

a. 100% testing of all vent valves to verify the 6 psi opening pressure during activation procedures. ✓

b. All batteries will have a 12 hour stand time between activation and installation in the vehicle to further assure that the battery is stable. ✓

Arrangements were made with the company for manufacture of 10 new batteries incorporating all of the corrective measures and these will be delivered to the Cape on Monday, 8/22, and an additional five batteries to be available on 9/2. ✓

We are now confident that the battery problem is well in hand and that no failures of this nature will occur in the future. ✓

8/22/66

B 8/26

F-1

R-P&VE and R-TEST-S recommendation on F-1 engine S/N 4017 (S-1C-2) was accepted by I-E-F and this engine will be tested on August 22, 1966, with the original orifices to duplicate conditions of test FW-047. If the combustion in the gas generators is stable, then the engine will be reorificed and refired to move further away from the buzzing range. If the gas generator experiences instability, necessary engine hardware changes, tests and engine disposition will be decided. ✓

S-II

The final briefing on proposed improvements for S-II-11 and subs was presented by S&ID Friday, August 19, 1966. The following areas were discussed:

a. Possible adaptation of spray-on foam insulation on S-II-11 and subs.

b. Stage system improvements resulting from the possible incorporation of the J-2S engine.

c. Replacement of the S-II prevalves with spool pieces. S&ID proposed that the prevalves removal be contingent on use of the J-2S. Opposition was voiced by R-P&VE and R-TEST.

This same presentation will be presented to higher management of MSFC on September 15, 1966.

S-II stage checkout plans review meeting resulted in General Phillips' decision to delete post-static checkouts which are redundant to KSC plans. ✓

S-II (MTF)

S-II-1 was installed in the A-2 Stand on Friday, August 19, 1966. ✓

S-IVB (SACTO)

The acceptance firing of stage S-IVB-206 was slipped one day due to the requirement to add extra accelerometers to the lox feed duct. The countdown was started Thursday, August 18, 1966, and an apparently successful duration firing was achieved late Friday, August 19, 1966. ✓

S-IB

Checkouts of S-IB-7, in preparation for propellant loading test and static firing, progressed satisfactorily. The propellant loading test is scheduled for August 25, 1966, and the short duration firing for September 1, 1966. ✓

COMMENTS TO BALCH NOTES (8/15/66)

Mr. Balch's notes of 8/15/66 (copy attached to Dr. von Braun and Mr. Weidner) state that welding of the holddown arms has proceeded with only minor difficulties. The weld procedures used at MTF produce welds which look very good. However, weld samples tested by R-P&VE-MM show these welds to be more brittle than those used at MSFC. This has been discussed at some length with MTF and with Corps of Engineers, and the problem is being resolved. ✓

Dieter Frau  
Suggest to  
establish a uniform  
recording system in  
deficiencies  
found in post-  
static checkout  
by the time  
we get to S-II-11.

B



8/22 JS

B 8/26

1. COMPUTER SHARING: The Computer Sharing Exchange Center, in working with the General Services Administration, has handled 12 requests for time sharing of computers. Most of the requests have been referred to other Government agencies for accomplishment. Marshall has supported four of the requests, one of them being a job for the New Orleans District Corps of Engineers, requiring about \$200,000 worth of computer time on a reimbursable basis. ✓

The Manager (Computation Laboratory, MSFC) of the Sharing Exchange has recently visited eight of the Government agencies in conjunction with the GSA representative in Alabama and Mississippi to promote the use of the program. The overall attitude is very receptive and cooperative. ✓

2. MSFC ADP SURVEY: The MSFC ADP Survey has been completed. Survey reports for general reference are being retained in Computation Laboratory central files. Performance by the contractor, Booz-Allen Research, Inc., was excellent. Impact of survey results to date are: (1) Better and more complete information than ever before for managing MSFC computing, (2) MSFC was prepared in advance to supply information for MSF ADP survey. ✓

3. SOUTHEASTERN SIMULATION COUNCIL MEETING: The Simulation Branch of the Computation Laboratory will host the Southeastern Simulation Council Meeting September 27, 1966. This council is one of the eight councils throughout the United States that was organized to promote and exchange information in the area of simulation. ✓

4. COMPUTATION LABORATORY TELEPROCESSING SUPPORT TO KSC:

A remote terminal is being installed at KSC and connected to the Data Center teleprocessing system in Building 4491. This terminal has dual application:

a. Phase 1 will provide a link from the Autodin terminal in Building 4207 to KSC. This will allow two-way communication between KSC and various depots (GSA and DOD).

b. Phase 2 will allow KSC to process material requests against MSFC inventories; items in long supply will be provided; and notification of status or action taken will be provided on all requests.

Schedule for Phase 1 - August 1

Schedule for Phase 2 - September 2 ✓

B 8/24

AS-202 COUNTDOWN: The countdown of AS-202 spacecraft started at 2 days, 10 hours, 30 minutes at 7:00 AM EST this morning. As of this time there are no known problems on either the spacecraft or launch vehicle that would delay the launch. The only activity scheduled for today on the launch vehicle is the IU environmental control system test which starts at 10:30 AM EST this morning. ✓

IU BATTERY PROBLEM: The IU battery problem for AS-202 was closed out Friday, August 19. Seven new batteries are to be delivered to KSC today from Eagle Picher. These batteries will not include the styrofoam type material between cell 17 and the adjacent cell which, in conjunction with faulty potting, caused the internal short. This material has been removed and replaced completely by potting compound. In addition, several of the original series of batteries were returned to Eagle Picher and run through a qualification test which included checking them out at higher internal pressures. These batteries will also be available as spares. ✓

ORBITAL WORKSHOP: In the test program being conducted by DAC for a fire retardant material to be used in the LH<sub>2</sub> tank for vehicle 209, no acceptable material has been identified.

Results from DAC tests on Dynatherm D-65 did not agree with tests performed by MSFC on the same material. DAC and P&VE test results differed in the area of toxicity and on the question of whether or not Dynatherm would crack in the LH<sub>2</sub> environment. A meeting was held at DAC on August 18 to review test procedures and test results with the intent of resolving differences and making recommendations on how to proceed from this point. DAC, P&VE and IO personnel were represented in the meeting. As a result of the meeting, it was agreed that there is no toxicity problem as earlier indicated by DAC test results; however, it was also agreed that there is evidence that cracks may form when Dynatherm is subjected to the LH<sub>2</sub> environment. The recommendation was for further testing to investigate flaking.

We have now reached a critical point in the assembly schedule and DAC has stated they must move the stage to the next assembly location without having installed the fire retardant material. ✓

Indications are that applying the material later could cost us a couple weeks of delivery schedule slippage on 209. We will follow this closely to see that any schedule slippages are minimized and that we don't get a fire resistant material that flakes off in the LH<sub>2</sub> tank. ✓



NOTES 8/22/66 JOHNSON

8/22/66

B  
8/26

S-IVB Workshop - During the 8-16/17-66 Doug Lord Review Group meeting, OMSF accepted sponsorship for the following experiments:

- MSFC # 42 - Surface Adsorbed Materials Collection
- MSFC # 35 - Joining Tubular Assemblies
- MSFC # 36 - Electron Beam Welding
- MSFC # 37 - Heat Pipe Demonstration
- MSFC # 31 - ST-124 Removal
- MSFC # 32 - P. U. Valve Removal
- MSFC # 52 - SLA Panel Repositioning ✓

Experiment Development Plans (EDP's) will be completed for R-EO review by 9-2-66. ✓

For two experiments, not yet accepted by OMSF for sponsorship:

MSFC # 28 - Leak Detector

MSFC # 34 - Space Bonding ✓

EDP's will be prepared as "backup" in the event other experiments can be added to the Workshop. ✓

see Bill Lucas Note

MSFC Experiments 3-7 Project "THERMO" - The initial meeting between government and contractor personnel was held in the P&VE Lab on 8-18-66 for orientation and clarification of requirements for Phase "B" study effort to be performed under contract by DAC (Prime) during period August, 1966 - March, 1967. ✓

X-Ray Astronomy Experiment S-027 (MSFC # 49) - A procurement request for the first AAP funded MSFC In-Flight Experiment was initiated on 8-16-66 for \$500K to negotiate a contract with the University of Wisconsin. This contract will provide for the design, development, and fabrication of flight model instruments, and associated ground hardware for use in the exploration and mapping of X-Ray emission in space.

Bill N.

Is  
Nancy  
Roman

aware and  
in agreement with this?

B



NOTES 8-22-66 KUERS

8/22 KB

B 8/26

**Negative report.**

30/27

1. ADVANCED ENGINE SUBPANEL FORMED - A Subpanel on Advanced Cryogenic Rocket Engines was established under the Supporting Space Research and Technology Panel of the Aeronautics and Astronautics Coordinating Board by an action of the 38th meeting of the Aeronautics and Astronautics Coordinating Board (AACB) on July 5, 1966. The Subpanel is responsible for facilitating information exchange between NASA and DOD and is authorized to conduct periodic joint management meetings to review progress and develop over-all program policy and guidance. Its scope includes the advanced technology programs covering high performance liquid oxygen-liquid hydrogen rocket engines. Del Tischler is chairman of the Subpanel consisting of four NASA and four DOD-AF members, and Dr. Hap Schultz of DOD is the vice chairman. Jerry Thomson (P&VE) is the MSFC member. The Subpanel is formulating the program policies required to implement the recent AACB ruling to conduct the NASA/USAF advanced engine programs at 250,000 pounds thrust. ✓

2. EXPERIMENT RACK - The End Item Specification, Part I, is expected to be finished by August 25. A meeting with KSC and MSC is planned for August 25-26 to discuss Interface Control Documents (ICD's) for the RACK/PM. ✓

3. NOSE CONES - The functional and procedural ICD's were signed by MSFC and MSC; they are at KSC for signature. MSC has placed a new requirement for an inside coating with emissivity of 0.3 or less. We will attempt to provide this. ✓

4. PROJECT THERMO - (Reference NOTES 8-1-66 LUCAS, paragraph 6) - Project THERMO (Thermo and Hydrodynamic Experiment Research Module in Orbit) consists of a low gravity heat transfer and fluid mechanics research module around standardized boiling, propellant transfer, and cryogenic propellant storage modules. These three systems will be designed so that the scaling and modeling laws will enable related experiments to be performed using the basic modules with their instrumentation, transfer, venting, photographic, heating, attitude control, and miscellaneous systems intact. ✓ The module concept will provide a standardized test system to obtain the necessary technology to design an orbital tanker, a cryogenic upper stage, or any space system that stores, transfers or utilizes cryogenics. ✓ In addition, the module will provide a research facility for other scientific experiments in various disciplines such as reliquification, stratification, Dielectrophoresis, etc. In the physical sciences, the basic facility will serve as a laboratory for the study of thermal and chemical diffusion, vapor liquid interface phenomena sensor technology, flame propagation. Design of a modular facility for the above purposes is based on the utilization of a LEM ascent stage (unmodified) as observer station and a LEM descent stage (basic frame) as the experiment carrier. We are scheduling a presentation for you on Project Thermo. ✓

NOTES 8/22/66 MAUS

8/22/66

B 8/27

NASA MANPOWER COMMITTEE: This committee, chaired by Mr. Hjernevik of MSC, will visit MSFC on August 30. Members of the committee are Hjernevik, S. Keller (Goddard), M. Butler (Langley), H. Barnett (Lewis), W. Meade (Ames) and H. Gorman (MSFC). The purpose of the committee is to devise a manpower system which will give Dr. Seamans the information and the flexibility he needs to make work assignments to the centers. We have arranged with Bonnie for you to meet with the committee for one hour on August 30. ✓



3 8/27

NOTES 8/22/66 RICHARD

0/22/66

MSFC Software Systems: The Automation Plan presentation last week again impressed upon me the need for a technical presentation on our integrated hardware-software systems, both flight and ground. I believe we can show at significant points in prelaunch and inflight what is going on in our software system and how the hardware and software work together. To make it pertinent we will use upcoming flights and talk specifics. Such a presentation should help clear up this area for the people who do not work directly in it and erase some of the fog which at times seems to exist. As soon as we can get this presentation together, we will make the necessary arrangements.

✓

NOTES 8/22/66 RUDOLPH  
8/22 RB

B 8/27

**Negative Report**

B 8/27

NOTES 8/23/66, SPEER

8/22/66

1. AS-202 STATUS: AS-202 is still on schedule for a 25 August launch. The Flight Readiness Test was successfully completed 15 August with no major problems. S-IB RPl loading was completed and S/C hypergolic loading began 18 August. A briefing was given 16 August to the Huntsville Operations Support Center (HOSC) terminal countdown contractor, R&DO and Program Office support engineers on the LIEF/HOSC activities to be performed during the terminal countdown and launch. Approximately 50% of the total support group attended. ✓
2. AS-204 ORBITAL FLIGHT: We have requested a revision of the LOX and LH<sub>2</sub> venting times such that they should occur over Bermuda and Carnarvon. This will enable flight controllers to attempt corrective action by ground command in case of valve malfunctions. Consequences of the new venting times are being investigated. ✓
3. SHIP SUPPORT FOR AS-202: Ship instrumentation for support of AS-202 has again undergone perturbations. The Rose Knot Victor (RKV), scheduled for a location southeast of Antigua for support of both the first burn of the Service Module and the S-IVB common bulkhead test, has been repositioned by MSC to provide more favorable aspect angles for spacecraft coverage. The movement is from south to north of the trajectory flight path, resulting in a significant deterioration of S-IVB support. However, in addition to the RKV, aircraft are also available for S-IVB common bulkhead test support.
4. REVIEW OF MISSION OPERATIONS ACTIVITIES WITH SATURN V PROGRAM OFFICE: A review of our activities was conducted on August 16 with key personnel of the Saturn V Program Office including Dr. Rudolph. The primary purpose of the review was to promote a better understanding of the MSFC role in Operations and the interface between the two offices prior to the preparations for the AS-501 flight. The review covered LIEF, Mission Rules and Operations Support Requirements. Since time was limited, Flight Control activities will be covered at a later date. It is felt that the review was well received by the Program Office. ✓
5. AS-203 BREAKUP: At acquisition by Trinidad (4:15 EST, July 5) the vehicle was already destroyed as determined by the playback of the C-Band radar tape. There were approximately 150 pieces in a 40 mile range window. The next NORAD radar which had an opportunity to track the vehicle reported approximately 190 pieces at 1:40 am CST on July 6. The last observable piece decayed on July 22. An attempt was made to determine the change in velocity of approximately 20 pieces but not conclusive results were obtained. Best estimates are that the separation velocity varied between 80 and 400 meter/seconds. ✓



8/22/66

1. ATM EXPERIMENT: Members of IO, ASTRI, P&VE, and RPL visited NRL (Dr. Friedman's Laboratory) last Tuesday to discuss the solar UV experiment for the ATM payload. Although the primary objectives of their ATM experiment are very nearly the same as those of their former AOSO experiment, there are some basic differences between the two projects (astronaut participation; film recording; thermal design) which make a modification of the experiment design necessary. Principal investigators stated their urgent need for basic design and operational data of the ATM system. The initiation of the experiment design depends critically on a complete description of the interfaces with the ATM system. Experimenters expressed grave doubts that a launch date in 1968, or even 1969, can be met. ✓

2. LUNAR EXPLORATION STUDIES: We are still working vigorously on the lunar surface mission planning effort for MSF. Present emphasis is on comparison of the LM/Shelter - LM/Taxi mode with the Augmented LM mode. Phil Culbertson again expressed appreciation for the mission planning work we have been performing; this applies particularly to the work of Jim Downey and his associates. The Brown support for these activities has been excellent. Hopefully, the future involvement of MSFC in lunar exploration work can be clarified soon to the point where our present work in mission studies, drill, surveying staff, IR and UV measurements, scientific instruments, and soil mechanics investigations can be either transferred to MSC, or continued in a fashion which does not overburden us in view of the ATM and other projects in which RPL will be heavily involved. ✓

3. SEISMOGRAPHIC MEASUREMENTS: Dr. I Dalins has had a discussion with Mr. Jones of KSC about the seismographic investigations of signals produced by large rocket firings at MSFC as well as at the Cape. Mr. Jones was very much interested in our seismographic instrumentation. He felt that our approach to the problem is the most sophisticated and advanced he has seen. KSC wants to make a decision as to what type of instrumentation they should get. Dr. Dalins will give them advice and assistance in this effort. ✓

8/22-98

B8/27

1. GM MTA: On-pallet tests and provisional performance tests on the manned configuration MTA were conducted on August 17, 1966. Mobility performance tests in the unmanned configuration were conducted on August 18, 1966. These included a soft surface drawbar pull test and slope climbing. Provisional acceptance tests were conducted on Friday, August 19, 1966.

All tests were successful with satisfactory results up to the last scheduled test on Friday. During this last test (scuff steering), several transistors blew while balance adjustments were being made by GM in a procedure prohibited by the manual. Correction and recheck will cause a delay of approximately one week in shipment to Aberdeen, originally planned for August 23, 1966. ✓

2. Augmented LM vs. Shelter/Taxi Comparison: The above comparison has been completed and we are putting the final touches on this data. The information has been reviewed with I-S/AA. The results of this comparison show a shelter/taxi concept to be the better of the two approaches, both from a cost effectiveness and scientific effectiveness standpoint. The augmented LM concept; however, is approximately \$100M cheaper (750M vs. 650M) for two launches. In addition, the augmented LM requires smaller FY-68 dollar commitments. It should be noted that full definition of the augmented LM is not yet developed. The present performance figures show 3-1/2 days staytime and 850-lb. payload. There is no contingency in these numbers, and the margins at this stage of the game are such that both of these numbers will probably be reduced significantly before an actual flight. The shelter performance is 14 days with 3,000-lb. payload and 1,000-lb. contingency for growth of the shelter. ✓

3. NASA Space Station Configuration Study: ASO has begun activities in support of the NASA Space Station Review. Organizational and personnel assignments have been made. Headquarters has imposed an extremely tight schedule but work is underway and progressing satisfactorily. ✓

August 29, 1966



NOTES 8/29/66 BALCH

8/29/66

B9/5

S-II-1 Testing - Without removing stage from stand,  $LH_2$  tank has been entered to perform preliminary work necessary for replacing three bonded doublers with three mechanically fastened doublers. Installation of new doublers is expected to start late today or tomorrow. Estimated time required for doubler replacement is about 10 days. Total impact on S-II-1 test schedule of this and other developments is anticipated as being less than 10 days but will be further evaluated after pneumastat of S-II-3 Seal Beach. ✓

S-IC Test Stand - No major new problems are foreseen at this time, and it appears that the B-2 position will be ready to receive the S-IC-T stage the first part of December. The installation of the holddown arms, which is one of the pacing items, is proceeding satisfactorily, and overall alignment is still within specified tolerances. The welding on one holddown arm is complete and the alignment of the actuator for this and one other holddown arm is in process. ✓

S-IC-T Test Plans - Present plans are that the S-IC-T will arrive at MTF about the middle of November and go on stand in early December. Integrated checkout with GSE is expected in early January. ✓

S-II Test Stand A-1 - Completion of major portion of facility construction, without cleaning, is still expected the last of October 1966. Installation of technical systems and GSE is currently on schedule, but further progress is dependent on some JOD's and partial BOD's which are presently uncertain. ✓

MTF Lox Barges - KSC has requested consideration of loan of MTF Lox Barges as a work around to their Lox tank failures. MTF recommendation has been forwarded to I-V-MGR. ✓

NOTES 8/29/66 BELEW

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PAYLOAD INTEGRATION

CONTRACTOR'S EFFORT ON MISSION

209/211/212/213: Both Martin and Lockheed have been given a "task" to study the 209/211/212/213 mission as proposed by Dr. Mueller during his recent visit. The "guidelines" developed for use in the in-house study will be passed to both contractors Monday (8/29/66). We expect to conduct the contractors' studies "independent" of the in-house effort. We plan to have the contractors' inputs a week or so before the completion of the in-house study. ✓

INTEGRATION OF EO-2: As you are aware John Disher has asked us to look at the relative merit of integrating these experiments either as a "completed package" delivered from another center or as individual experiments. Disher is also interested in the possibility of integrating these experiments with the ATM as well as on the LM/Half Rack without the ATM. Both contractors are studying these alternatives (strictly from the integration and mission performance standpoint). Fred Digesu has been asked to assist in pulling together an "in-house" position. I have meetings planned with Digesu and the two contractors (separately) next week. ✓

S-IVB AIRLOCK CONTRACT: A meeting was held on Friday, August 26, with Headquarters, MSC and MSFC participation to discuss phases of the contract for the Airlock. These discussions will be continued at MSC later this week. ✓

RACK-STRUCTURAL SUPPORT SYSTEM: (Ref comment on notes 8/8/66 What is LM & SS) - LM&SS (Lunar Mapping and Survey System) ✓ - We have settled on a budget requirement from MSC of \$585,000 for the delivery of five flight articles for the LM&SS (lunar mapping and survey system). These funds will be supplemented by Apollo Support funds and existing in-house analytical support and systems engineering effort. ✓

A decision has been made to shorten the Rack configuration to accommodate a forward interface due to a change in mission requirements for the LM&SS. This change is a result of Dr. Mueller's decision for a longer duration LM&SS mission. ✓

ARMY RADAR CALIBRATION SATELLITE: A meeting was held August 24 at ARPA, Washington. A brief review was presented by ARPA, Huntsville representatives to Col. Hill. Col. Hill has not thus far convinced DOD that this program has sufficient priority to obtain approval for sufficient funding. Col. Hill will notify NASA Headquarters within the next several days whether or not NASA support will be requested for this program. ✓

8/29/66

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F-1 ENGINE F-1 Engine System and Component Qualifications are continuing. Two production F-1 Engines, one for limits and malfunction and the other for endurance are being utilized. The limits and malfunction engine has completed 28 of the 44 objectives and the endurance engine has completed 1411 seconds of the required 2250 seconds. Both engines should complete their qual requirements by mid-September. Forty-five of the 48 components in the Component Qual Program have completed component qual. The three remaining components are scheduled for completion in September.

Engine 4017 (S-IC-2 position #1) completed two recalibration tests at MSFC Test Lab. A repeat of the test conditions of July 18, 1966, was conducted on August 23 to determine the performance baseline. The mainstage gas generator oscillations encountered on 7-18-66, did not recur, however, in order to shift the dynamic balance away from the oscillation engine the engine was reorificed. The engine was refired on 8-24-66 with satisfactory results. The engine thrust was 1520K. The engine is scheduled for installation in S-IC-2 at Qual Lab on Saturday, 8-27-66. ✓

C-1 ENGINE Nozzle-up basic engine ignition testing at continuous 100,000 feet altitude was continued. To date, a total of 1924 starts with 20°F propellant inlet temperatures have been successfully completed. The pulse on times were 0.025, 0.080 and 0.500 seconds with pulse off times 0.042, 0.020 and 1.000 seconds, respectively. Tests to evaluate shorter pulse widths (0.010 seconds) will also be investigated at all three propellant inlet temperatures. ✓

H-1 ENGINE All eight engines performed satisfactorily during the launch of SA-202. ✓

J-2 ENGINE <sup>2B</sup> An ASI LOX line failure was experienced on engine J2048 at MSFC on 8-11-66. The failure was in the line between ASI LOX manifold and the ASI. This failure is believed to have been caused by the installation of a 1½ pound pressure transducer that was mounted on the ASI manifold. This transducer is not standard instrumentation and was being used to monitor ASI LOX pressures. During the same test, and completely unassociated, a fire was observed in the engine area. Inspection revealed that an unused capped instrumentation port on the ASI fuel manifold was leaking. It was determined that a "hot-gas" seal had been installed rather than a teflon coated cryogenic seal as specified on the assembly drawing. The seal had been installed since the engine was delivered. The engine illustrated parts breakdown document calls out the correct part number for this seal; however, the nomenclature is incorrect and is being corrected. As Rocketdyne assembles the engine to the assembly drawing which also calls out the correct part number, there is no reason to presuppose that other engines have incorrect seals.

The formal Qualification II (230K engine) engine system demonstration test series was completed 8-22-66. There were 30 tests for a total of 3807 seconds. Preliminary review of the data indicates the series was most successful; every test ran the programmed duration. ✓

Inspection of the LOX pump turbine wheel on engine J-2046 following the acceptance testing of S-IVB, SA 206 revealed the first stage turbine wheel had contacted the stator blades. The damage was sufficient to dictate a LOX turbopump change or total engine change. Currently the decision is to change out the LOX pump and re-hot fire the stage. This approach will yield the minimum stage schedule impact. ✓

The initial test at AEDC (7-27-66) was terminated 700 milliseconds after the start command by the engine fuel pump overspeed device. Preliminary review of the data indicated the overspeed indication was caused by faulty facility instrumentation. The next test is scheduled this week. ✓

Due to failures on the S-II Battleship of engine control lines, six control lines on S-II stage SA 501 are being replaced at MTF. These lines are redesigned by double welds at the flanges and shot peening. This redesign is similar to the ASI LOX line redesign. ✓



NOTES 8/29/66 CONSTAN

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Contract NAS8-4016, Chrysler Corporation Space Division

The RFP procurement of long-lead time items for four S-IB stages was presented to CCSD on Tuesday, August 23, 1966. CCSD was requested to reply by Wednesday, August 31, 1966. ✓

Contract NAS8-5608, The Boeing Company

Incentive fee negotiations applicable to the S-IC-11 through S-IC-15 follow-on have been continuous. The criteria for performance has been the major item of discussion and agreement in this matter is anticipated before the end of the week. The target date for agreement on incentive fee arrangement is September 1, 1966. ✓

S-IC-3

Post manufacturing checkout, was successfully completed at 9:00 p.m. on August 24, 1966, (Wednesday). The vehicle will now be prepared for shipment to R-TEST for acceptance testing on September 24, 1966. ✓

NOTES 8/29/66 FELLOWS

8/29/68

1. R&D Operations FY-67 Overtime Funding: The allocation of FY-67 funds for payment of overtime is approximately \$240,000 less than the amount actually used in FY-66. Overtime management and control during FY-66 were emphasized by senior management throughout R&D Operations and total overtime usage was held under six percent. With further curtailment of funds for FY-67, even tighter management control and increasing assessment of priorities will be necessary. The laboratories have been advised by R-DIR of the overtime funds allocated to each laboratory with the admonition that stringent controls are necessary and prior approval is required before undertaking work which might cause an overrun in that laboratory's overtime account. ✓

NOTES 8/29/66 GEISSLER

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8/29/66

1. AS-202 Flight Results: No major problems have been identified as yet with the launch vehicle on the AS-202 flight. ✓ Outboard engine cutoff occurred 0.7 sec earlier than predicted and S-IVB cutoff occurred 13.4 seconds earlier than predicted. Guidance data indicates that velocity was 1.3 m/s greater, altitude was 0.4 km higher and range was 38.5 km shorter than predicted. EDS abort parameters of angular overrates and two S-IB engines out were in closed loop for the first time on AS-202. The system functioned properly. Maximum noise amplitude on the unfiltered rate gyro output was  $\pm 1.4$  deg/sec during the transonic region of flight. The acoustic levels appear to be similar to the AS-201 flight. Both recoverable cameras on the S-IB stage were ejected properly, however, only one was recovered again. A fairly large disturbance (5 deg/sec) was noted on the S-IVB/IU/SLA when the spacecraft service module propulsion system ignited on the spacecraft after separation. All spacecraft systems functioned properly except for some problems in the ECS cooling and S-Band Communications. All four SPS burns were apparently satisfactory. Apogee was about 4 nm higher than predicted. Attitude control was completely satisfactory. Re-entry velocity was within 12 ft/sec of the predicted, and path angle was essentially nominal. Impact was about 205 n mi shorter than predicted. Cause of the miss distance has not been defined as yet. ✓

2. Adjustable Porous Walls Meeting: Recently there has been a growing interest on the part of several companies and government agencies in variable porosity transonic wind tunnels. Using our design as a basis, the Air Force Academy has designed and installed variable porosity walls in their 1-foot tunnel. ARO, Inc. (contractor at Tullahoma) at present is designing a new 4-foot tunnel with variable walls. It has been mutually agreed by these and several other interested groups that an informal discussion meeting would be of benefit to all. We shall have an informal meeting of about 6 companies and agencies at the bldg 4732 conference room on September 7, 1966. Several informal papers will be presented. It is anticipated that the discussion period will be quite beneficial. ✓

3. MSFC Sponsored Conference Participation: Work recently completed for us by Honeywell, Inc., under Contract No. NAS8-20155 (Design of a Load Relief Control System) will provide the basis for a paper to be presented by Dr. Grant Skelton (Honeywell) at the third annual AIAA meeting to be held in Boston on November 29, 1966. This paper, "Launch Booster Gust Alleviation," will also be presented at the MSFC Control Theory Symposium, September 19-21, 1966. ✓



8/29/66

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9/5RELIABILITY ANALYSIS PROGRAM PRESENTATIONS TO GENERAL PHILLIPS:

Presentations on "Saturn IB Reliability Analysis" and "Reliability Assessment Saturn IB and V" were given to General Phillips at KSC, August 22, 1966, by George Butler of this Laboratory. The "Saturn IB Reliability Analysis" presentation was given for the Saturn IB Program Office. During the presentations General Phillips showed considerable interest in our "equivalent mission" reliability assessment based on static firings and flight. He also asked several questions relative to the change of support contractor ~~ARINC~~ to ~~FEC~~ and the failure reporting system. At the conclusion of the presentations General Phillips stated he felt reliability should:

1. Place more emphasis on failure reporting and corrective action.
2. Shift reliability activity from the prediction area to assessment area.
3. Place special emphasis on hardware differences between flights.

General Phillips further stated that guidelines would be issued from his office as a result of the presentations. ✓

8/29/68

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1. STATUS OF SERVOACTUATOR PROBLEMS: You recently asked some questions concerning problem areas and potential problem areas in the S-IB and S-IC servoactuators. You also raised a question concerning the use of Titan/Gemini servoactuator in the S-IB and S-IVB. Following is a brief resume of the situation. We can furnish you more details in each area if you desire.

S-IB: The present S-IB actuator contains a potentiometer configuration which utilizes a printed cable circuit between the resistance elements and the external electrical connector. This has proved to be a source of manufacturing and quality control problems which the potentiometer vendor (Markite) could not or would not correct. As a result of this inter-connection problem, the change to conventional wiring was approved in January 1966. The intended effectivity of this change was S-IB-2. However, present commitments from Markite indicate that the modified potentiometers cannot be available before S-IB-9. The only available interim solution is to allow Chrysler to rework the potentiometers until modified hardware is available from Markite. ✓

S-IC: At present both S-IC servoactuator vendors utilize an aluminum alloy considered susceptible to stress corrosion; 7079-T6 in the Moog design and 2014-T6 in the Hydraulic Research design. A less susceptible alloy suggested by P&VE as a possible replacement (7075-T13) could not be employed because of its lower strength which would impose housing thicknesses unacceptable to the materials people. However, certain manufacturing process changes can be made which will make the presently utilized materials less susceptible to stress corrosion. These processes will be incorporated in all future purchases by Boeing. However, the problem is not considered sufficiently critical to justify the expense of additional purchases to retrofit all vehicles. Considerable data on servoactuators manufactured by Moog and Hydraulic Research and information obtained from similar programs support this opinion. Since 1958, both vendors have built a combined total of over 14,000 servoactuators of stress corrosion susceptible materials for such programs as the Atlas, Titan, Polaris, Gemini, Bell Helicopters, McDonnell Aircraft, and others. None of these actuators have experienced stress corrosion problems. ✓

2. TITAN/GEMINI ACTUATOR APPLICATION: The Titan/Gemini actuator cannot be used in the S-IB because the actuator lengths and strokes are considerably different, and an incompatibility with the control computer would exist. The length, stroke, and input current requirements of the Titan/Gemini are similar to the S-IVB but the piston area, and consequently the available force, are much too low.

Although the Titan/Gemini actuator cannot be used directly on Saturn, the dual actuator concept could be used. Such a change would be costly, however, and would reflect into other subsystems. For instance, the control computer would have to be modified and a dual hydraulic system would have to be incorporated to realize the full redundancy benefits. No plans have been made to incorporate redundancy in the S-IB servoactuator and hydraulic

B9/5

F-1

Tests FW-050 and FW-051 were conducted on the West Area F-1 Test Stand with F-1 Engine S/N F-4017 on August 23 and 24, 1966, for a mainstage duration of 34.42 seconds and 40.52 seconds respectively. Test FW-050 was terminated by an observer due to excessive gas generator chamber pressure oscillations ("buzzing"). The engine was re-orificed before Test FW-051. Engine performance was acceptable for this test.

Engine S/N F-4017 was removed from the test stand on August 26, and returned to ME Laboratory. ✓

S-II Battleship

Leak checks were made on S-II Battleship following Augmented Spark Igniter (ASI) line cracks found on MSFC S-IVB Battleship, and disclosed cracks on Engine No. 2036 in the same location as at MSFC. Pressure transducers on No. 2036 will be bracketed for the next firing scheduled for August 31, 1966. ✓

S-II-1

The LH<sub>2</sub> tank is being entered while in the test stand to inspect and repair stiffeners added to horizontal stringers at Seal Beach prestatic checkout. ✓

S-IVB (MSFC)

Two tests (S-IVB-033 and -034) were conducted at the S-IVB Battleship Test Stand. Both were planned for lox depletion cutoff at approximately 300 seconds. ✓

Test S-IVB-033 was terminated at 20.38 seconds when the lox pump inlet pressure exceeded the redline minimum. The lox tank cold H<sub>2</sub> pressurizing system was inadvertently disarmed, preventing repressurization.

Test S-IVB-034 was successful; however, a previous attempt failed due to the lox pre valve not opening just prior to ignition. ✓

GSE

As reported in the notes (August 8, 1966) (copy attached to Dr. von Braun and Mr. Weidner), we have completed testing of the swing arms for 501 and are preparing the arms for shipment to KSC. KSC was unable to provide the spare parts required, therefore, to accomplish the test program on the swing arms for 501, it was necessary to cannibalize components from the swing arms for Lut 3. ✓

Due to the shortage of hardware, it has not been possible to start the test program on Lut 3 swing arms. ✓

A complete assessment of the hardware situation and the test program shows that there will be a six-week slip in delivery date to KSC to accomplish only the minimum test program on Lut 3 arms. KSC and the Saturn V Office are aware of the problem. ✓

S-IB-7

Flight sequence was performed on August 24, and propellant loading test on August 25, 1966. No problems were encountered and preparations for the short duration firing on September 1 continue. ✓



F-1

Test TW-048 was conducted at the West Area F-1 Test Stand with F-1 engine S/N 2010 on August 5, 1966. This engine will be refired and is planned to be installed on S-1C-T. F-1 engine S/N 4017 revealed no irregularities upon teardown and inspection of the gas generator system. Rocketdyne has recommended that the engine be re-orificed (increase GG fuel flowrate) and fired again. If the test is good (performance and no GG oscillations) then the engine will be installed on S-1C-502. P&VE and R-TEST-SP prefer engine re-test (additional instrumentation) with same orifices to establish a baseline for re-orificing and also, primarily, to determine the cause of the initial GG oscillation (FW-047).

S-11 (MTF)

A meeting was held during the week ending August 5, 1966, to review S-11-1 acceptance specification and criteria. Facility interface checkouts, using GETS, were accomplished in preparation for S-11-1 arrival scheduled for August 16, 1966.

GSE

Testing of flight umbilical on Arms 6 and 7 (S-IVB Aft and S-IVB Forward) was completed this past week. This completes testing for all 501 Arms except Tail Service Masts.

Due to a shortage of KSC supplied spares, complete refurbishing of the swing arms cannot be accomplished. The 501 set of hardware will be delivered to the Cape with defective valves, regulators, pressure switches, etc. All of these components will be identified to KSC and will require replacement and service arm system test sometime during 501 checkouts.

A complete assessment of the next set of arms to undergo testing will be made this week. KSC has not been able to provide the spares required and in many cases, hardware was removed from the 3rd set of equipment in order not to impact the testing of the 501 Arms. Lack of spare part support from KSC could have a serious impact on the schedule of the next set of hardware.

NOTES 8-29-66 HOELZER

8/29/66

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RESOURCES SHARING WITH ELECTRONICS RESEARCH CENTER: Computer program flow charts and documentation are being furnished the Electronics Research Center (ERC) at their request by our Data Center Division. This is in line with the NASA ADP Resources Sharing System for computer programs. Documentation is being furnished on the Program Operating Plan, Procurement, Personnel, Labor Distribution, and Payroll Computer Systems. ERC is initiating a basic effort in business data processing, and more assistance will be given where possible in the future. ✓

NOTES 8/29/66 JAMES

B 9/5

8/29/66

LOW COST SATURN: I met with Dick Cook and members of my office, Frank Williams' office, and Ludie Richard's office, Friday on the low cost logistics Saturn/Apollo vehicle. We are somewhat handicapped by the lack of firm mission planning, however, we are analyzing which of present missions could possibly go on a stripped down vehicle. When we get a feel we will brief you on our proposed approach. ✓

QUALIFICATION TEST PROGRAM: Roy Godfrey, Jim McCulloch, members of R&DO and I are going to DAC this week to review the qualification test program. SA-204 is the end of the line for postponing various tests. We want to be sure the S-IVB is ready for the DCR, since the S-IVB is the worst case. ✓

FOLLOW-ON PROCUREMENT: We have received a copy of the Program Approval Document signed by Dr. Seamans, which permits us to go ahead with long lead time procurement and necessary administrative actions for the follow-on procurement. There is some indication that headquarters wants to approve everything we buy. We will attempt to keep the program management in Huntsville. ✓

SATURN IB FLIGHTS: Thanks to a lot of MSFC and contractor personnel, we seem to have passed the Saturn IB unmanned flights successfully. ✓✓ We have busy days ahead and will need a lot of help getting ready for the first manned Saturn, whichever flight may be so designated. ✓



NOTES 8/29/66 JOHNSON

8/29/66

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X-Ray Astronomy Experiment S-027 (MSFC #49) - On 8-23/24-66 Dr. F. Scherb University of Wisconsin, participated in a pre-negotiation conference on the experiment with R-ASTR laboratory personnel. ✓

MSFEB Meeting 66-5 - Meeting is scheduled for 9-19-66. The tentative agenda indicates that the following items will be covered:

Apollo Telescope Mount (ATM) experiments

- S-052 - White Light Chronograph
- S-053 - UV Coronal Spectrograph
- S-054 - X-Ray Spectrographic Telescope
- S-055 - UV Spectrograph
- S-056 - Dual X-Ray Telescope

Orbital Workshop experiments (S-IVB)

OSSA Proposals for Apollo

A draft of the proposed agenda will be available on 8-30-66.

As suggested by Dr. Reiffel, the principal investigators for the Workshop experiments will be available at the meeting to answer specific technical questions about their proposals. ✓

Bill J.

Is this part of EMR?

or on

what flight?

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8/29 JRB

B 9/5

1. S-IC:

S-IC-501 rolled out of Building 4755 at 8:15 a.m. last Friday for shipment to KSC. ✓

S-IC-502 is in final checkout at R-QUAL. Every effort is being made by our personnel to re-install the last engine on this stage after re-static firing. ✓

S-IC-T is presently in Building 4755 for modification in order to update it to the -504 configuration. ✓

2. S-IVB Flutter Panel Wind Tunnel Model:

This device has been completed in our shops and delivered to P&VE last week. ✓

3. Shop Workload in ME Laboratory:

Workloads in our shops continue to be very heavy. The following projects that we are presently engaged in might serve as examples for the type and variety of our work: Nose Cones for 206, 208, and 210; Damper Arms for Saturn V; S-IC Test Stand Adapter Ring; Common Ordnance Containers for S-II; LEM Racks; 1/10 Scale Models of Saturn V; Wind Tunnel Models; Laboratory apparatus for RPL; Deflection Test Cylinders for P&VE; and a hundred other smaller jobs for support of IO and the laboratories. A high percentage of this work is being carried out by our Single Support Contractor. However, requirements for special equipment, skills, time schedules, and funding are in many cases such that the major load must be carried by our shops. ✓

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NOTES 8-29-66 LUCAS  
8/29/88

1. ORBITAL WORKSHOP - A meeting was held at DAC last week to review the test programs on the D-65 overcoat for the internal insulation. It was determined that DAC corroborates our data that toxicity is not a problem and that the coating does not spall. Nevertheless, DAC still has some reservations about the use of D-65 and is continuing certain testing. ✓
2. IN-FLIGHT EXPERIMENT #9 - Since the lubrication experiment (MSFC #9) has been deleted from AS-209, we are planning to reschedule it for flight on AS-216. The experiment will be revised to incorporate a prototype motor and gear train for the torque motors on the Apollo Telescope Mount. ✓
3. S-IVB-206 ACCEPTANCE TEST - The acceptance firing of S-IVB-206 was successfully accomplished on 8-19-66. The mainstage duration was 433.7 seconds. All systems appeared to operate normally throughout the count-down. Post-firing check indicates metal chips in the LOX turbine. The turbine will be examined to determine if there is any damage. ✓
4. F-1 QUALIFICATION PROGRAM - A total of 9 tests (20 required) have been conducted on the endurance engine F-5037, with 7 full duration runs (5 required). The accumulated duration to date is 1259 seconds (2250 required). Twenty-five of the required 32 safety limits test objectives have been successfully completed on the limits engine F-5031. An attempt to complete the low mixture ratio objective this week was unsuccessful. The test was terminated prematurely when the LOX discharge pressure exceeded the redline due to improper orificing. Qualification testing will be completed by 9-16-66. ✓
5. S-II STAGE STRINGER CRACKING - S&ID is not able to identify the cause of cracking but is improving their manufacturing processes and inspection techniques. To avoid further deterioration of S-II stages, the following load limitations were imposed: (a) the S-II-F at KSC is limited to 36 total pressure cycles, no more than 6 to go to pressures higher than 10 psig and (b) the S-II-1 is limited to a total of 110 pressure cycles up to 10 psig (30 at KSC and 80 at MTF), no more than 22 to go to pressures higher than 10 psig (6 at KSC and 16 at MTF). Outside patches will be bolted on over all cracked stringer ends to reinforce these areas. ✓
6. S-IVB FLUTTER TEST - The preparation for the Saturn S-IVB Panel Flutter Test is proceeding on schedule. The pressure survey model was delivered to the AEDC Preparation Building, 8-18-66. The testing will begin 9-19-66. Firm date for start of testing the flutter full-scale model is 10-3-66. ✓
7. ELECTROMAGNETIC RADIATION EXPERIMENT - In a meeting at Naval Research Laboratories on 8-23-66, between the NRL experimenters and P&VE, RP and ME personnel, P&VE's inputs to the design of the X-Ray and ultraviolet spectrograph experiments were discussed. These discussions included the P-10 gas supply system, component thermal control, X-Ray counter description and assembly of counters into a 100 sq. ft. array, astronaut requirements and UV cameras film transport design. ✓



MAUS-8/29/66-NOTES

8/29/66

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NASA MANPOWER COMMITTEE: As stated in our NOTES last week, this committee will meet with MSFC management on August 30. You will personally meet with the Committee at 2:00 p.m. on the 30th. We are preparing notes for your use during these discussions. A dry run of materials to be presented to the Committee was held for Dr. Rees and Mr. Gorman on August 26. ✓

NOTES 8/29/66 RICHARD

8/29/66

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Swing Arm Testing on Complex 39: There is growing concern in MSFC about swing arm complexity and the fact that there is insufficient test time and operating experience with the arms. Planning to date in this area has called for the arms to be activated and tested in the VAB only. We are discussing with I-V and KSC the possibility of a swing arm test on the pad to exercise any last minute required design changes and to know the overall system will still operate after a long stay on the pad. This may require some modification to the mobile service structure, but we feel this capability should exist anyway.

Integrated ATM and Orbital Workshop: The Technical Systems Office has assumed the technical lead in the feasibility study of an integrated mission of the Apollo Telescope Mount and the Orbital Workshop. We are coordinating R&D Operations laboratory efforts and will prepare a presentation to management on the results of the study.

8/29 JB

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2/51. S-IC-1 Stage:Checkout - (Reference Notes 8/8/66 Grau, copy attached)

- o Pre-delivery Review of S-IC-1 conducted on Tuesday, 9 August 66.
- o Redesign has been established for all known design discrepancies.
- o R&DO Labs, IO and KSC unanimously agreed that stage was ready to ship.
- o Shipment - S-IC-1 Stage left MSFC at 5:00 pm, Friday, 26 August 66, and is estimated to arrive at KSC on Wednesday, 7 September 66. ✓

2. S-IC-3 Stage - Post manufacturing checkout was successfully completed on Wednesday, 24 August 66. A MSFC/Boeing Stage review scheduled for Thursday, 1 September 66, prior to releasing the stage to acceptance test. ✓

3. S-II-1 Stage - Stage in Test Stand

- o Removal of bonded doublers and installation of new mechanical doublers scheduled for completion by Friday, 12 September 66.
- o First firing anticipated on Monday, 19 September 66. ✓
- o Assuming two successive and successful firings, stage estimated on dock date at KSC 19 November 66. ✓

4. S-II Spacer - at KSC. All modifications and installation of GFE electrical cable completed on Wednesday, 24 August 66, two days ahead of schedule. ✓

5. S-IU-501 - delivered to KSC via Super Guppy on Thursday, 25 August 66. ✓

Attachment: a/s DIR, I-DIR, R-DIR's copy only)



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9/5

NOTES 8/29/66 SPEER

9/29/66

1. AS-202 LAUNCH: AS-202 was launched at 11:15 AM CST on 8/25. The Mission Director's 24 hour report was published on 8/26 and distributed within MSFC. The report included MSFC inputs based on the HOSC report to the Mission Director, dispatched about 2 hours after liftoff. LIEF support was utilized by both Launch Operations and Flight Operations with some of the problems requiring specific recommendations within very short lead times. MSFC positions were required on the following problems: (a) Ground Wind Restrictions; (b) IU Battery Redline ; (c) Elimination of the second EDS test; (d) S-IVB LOX Chilled Pump Purge Valve; (e) Fire Detection System, and (f) RP-1 Load. In general it is felt the performance of the MSFC Support Engineers (including contractors) was very good. ✓  
The engineering test of displaying vehicle bending moments based on real time strain gage measurements was conducted by P&VE engineers and appeared to have been successful. ✓

2. HOSC ADDITION: Formal approval was obtained for the second story addition to the HOSC, on top of the Conference Room. Design is progressing satisfactorily. Every effort is being made to have the facility ready for AS-501 launch. ✓

8/29/66

B 9/5

1. PEGASUS COUPONS REMOVAL: Several meetings were held this week on the Pegasus III - Apollo rendezvous. Emerson Electric gave a presentation of the equipment necessary to be attached to the wing, restraining the astronaut while he is working in the coupon area; a container to allow the astronaut to file the coupons; a removal tool (wire cutter); and a pressure vessel to hold the coupons during reentry. North American Aviation gave a presentation on methods of transfer of the astronaut from Apollo to Pegasus. They preferred to use the backpack currently under development at NAA. Both companies have study contracts to Astrionics to look at this problem. Both feel that the operation is feasible; however, the amount of equipment necessary and the complexity of the operation is slowly but steadily increasing. The EVA time required for performance of the mission is coming uncomfortably close to the limits of the PLSS. The mission may be in trouble if this trend continues. ✓

2. POWER SOURCES CONFERENCE AT LeRC: On August 23-24, I attended a space power sources conference at Lewis which was excellently prepared and organized (attendance: 500). Most speakers were from LeRC; one or two from Headquarters-OART. Very interesting and encouraging progress was reported in battery and fuel cell work, and in component development work of photovoltaic, thermoelectric, thermionic, Rankine, and Brayton type converters, driven by solar, isotope, and reactor heat sources. However, the lack of a good development program for space power sources above 500 W<sub>el</sub> became again painfully evident. In fact, the disappointment and sadness about the absence of determined leadership for a space power program in the regime from a few kW to a few MW was the ubiquitous between-the-sessions theme. After hearing this review, I still believe that the best space power system between about 50 kWe and 10 MWe will be the nuclear heated, thermionic converter, combined with heat pipes. Work on this system is under way at a number of places, mainly at LASL, ORNL, GD/GA, and GE.

I am presently preparing a more elaborate note on the power sources situation. ✓

3. RELATIVITY EXPERIMENT: On August 22, Drs. Shelton and Edmonson (RPL) and Dr. Harvey Hall from OMSF, visited Princeton University, New Jersey, to confer with Prof. R. H. Dicke on the feasibility of an experiment to test the general theory of relativity by placing an artificial planet into elliptical orbit around the sun. In this proposed experiment, the dependence of the rotation of the perihelion on the quadrupole moment of the sun would be measured. It could not be fully established yet whether Prof. Dicke's accuracy requirements are attainable with existing tracking means. A brief inhouse study by AERO and RPL will clarify this. ✓

4. NEW NAME FOR RESEARCH PROJECTS LABORATORY: The name "Space Sciences Laboratory (SSL)" has been assigned to the former Research Projects Laboratory (RPL). This name will be used as of September 1, 1966.

Haus Maus

Do we  
have  
(and need)

approval for this name change by some cognizant Hq office? B



NOTES 8-29-66 WILLIAMS

8/29/68

Bg/s

1. Voyager - Saturn V: JPL is currently conducting a Voyager planning exercise, as follow-up to JPL/OSSA meetings and agreements in late July. The resulting concept and plan are to be presented to OSSA on September 13. The OSSA proposal is scheduled to go to Dr. Seamans in early October.

Several Marshall people spent time with JPL at Pasadena (Aug. 16 - 18), to provide and discuss launch vehicle inputs.

As you requested a few weeks ago, briefings on the overall Voyager program have been prepared and will be presented to you on September 1 (ASO and Labs). Other Center elements are being invited. *Was reviewed B*

2. Preliminary Study of a NASA Manned Space Station: Two MSFC working groups involved in the NASA Space Station Study (Requirements Group and Systems Planning Group) made progress during the week. The Requirements Group worked with LRC panels to formalize experiment requirements for systems planning and layout. The Systems Planning Group worked with the MSC Configuration Study Group in discussions of MSFC's approach, drafting an outline for the final report, and defining preliminary station concepts and criteria.

The formulation of requirements has not progressed well enough (except in astronomy) to help much in MSFC's systems planning. Our systems planning effort is presently supplementing its needs for requirements through evaluation of applicable past studies.

3. LSSM Procurement Plan: Comments have been received from internal MSFC organizations on the LSSM Procurement Plan. These comments are being incorporated and will be brought for your signature via the concurrence of Mr. H. Weidner and Mr. L. Belew.

The mid-term presentations by the contractors for this study are presently scheduled for October 11 and 12 at Bendix. I feel this is a particularly important series of presentations and encourage as much attendance of MSFC management as feasible.

*Bougie*

*Where?*

*Compatible with  
my schedule?*

*B*

*I'll  
check.*

*Ble  
9/6*